S

ENGINEERING CHANGE NOTICE	1. ECN 643829
Page 1 of 2	Proj. ECN

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.	4. USQ Required?	5. Date
Supplemental [] Direct Revision [X] Change ECN [] Temporary [] Standby [] Supersedure [] Cancel/Void []	Jim G. Field, Data Assessment and Interpretation, R2-12, 376-3753	[] Yes [X] No	09/09/98
	6. Project Title/No./Work Order No. Tank 241-SX-106	7. Bldg./Sys./Fac. No. 241-SX-106	8. Approval Designator N/A
	9. Document Numbers Changed by this ECN (includes sheet no. and rev.) HNF-SD-WM-ER-645, Rev. 0	10. Related ECN No(s). N/A	11. Related PO No. N/A

12a. Modification Work	12b. Work Package No.	12c. Modification Work Complete	12d. Restored to Original Condition (Temp. or Standby ECN only)
[] Yes (fill out Blk. 12b) [X] No (NA Blks. 12b, 12c, 12d)	N/A	N/A Design Authority/Cog. Engineer Signature & Date	N/A Design Authority/Cog. Engineer Signature & Date

13a. Description of Change

13b. Design Baseline Document? [] Yes [X] No

The document has been totally revised to include the results of recent sampling to address technical issues associated with the waste, and to update the best basis standard inventory.

14a. Justification (mark one)

Criteria Change	[X]	Design Improvement	[]	Environmental	[]	Facility Deactivation	[]
As-Found	[]	Facilitate Const	[]	Const. Error/Omission	[]	Design Error/Omission	[]

14b. Justification Details

Changes required to incorporate new sampling data.

15. Distribution (include name, MSIN, and no. of copies)

See attached distribution.

RELEASE STAMP

DATE SEP 16 1998

STA: 4

HANFORD RELEASE

ID: 58

ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1) ECN-643829

16. Design Verification Required	17. Cost Impact				18. Schedule Impact (days)	
	ENGINEERING		CONSTRUCTION			
[] Yes	Additional	[] $	Additional	[] $	Improvement	[]
[X] No	Savings	[] $	Savings	[] $	Delay	[]

19. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 13. Enter the affected document number in Block 20.

SDD/DD	[]	Seismic/Stress Analysis	[]	Tank Calibration Manual	[]
Functional Design Criteria	[]	Stress/Design Report	[]	Health Physics Procedure	[]
Operating Specification	[]	Interface Control Drawing	[]	Spares Multiple Unit Listing	[]
Criticality Specification	[]	Calibration Procedure	[]	Test Procedures/Specification	[]
Conceptual Design Report	[]	Installation Procedure	[]	Component Index	[]
Equipment Spec.	[]	Maintenance Procedure	[]	ASME Coded Item	[]
Const. Spec.	[]	Engineering Procedure	[]	Human Factor Consideration	[]
Procurement Spec.	[]	Operating Instruction	[]	Computer Software	[]
Vendor Information	[]	Operating Procedure	[]	Electric Circuit Schedule	[]
OM Manual	[]	Operational Safety Requirement	[]	ICRS Procedure	[]
FSAR/SAR	[]	IEFD Drawing	[]	Process Control Manual/Plan	[]
Safety Equipment List	[]	Cell Arrangement Drawing	[]	Process Flow Chart	[]
Radiation Work Permit	[]	Essential Material Specification	[]	Purchase Requisition	[]
Environmental Impact Statement	[]	Fac. Proc. Samp. Schedule	[]	Tickler File	[]
Environmental Report	[]	Inspection Plan	[]		[]
Environmental Permit	[]	Inventory Adjustment Request	[]		[]

20. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number Revision
N/A		

21. Approvals

	Signature	Date		Signature	Date
Design Authority			Design Agent		
Cog. Eng.	J.G. Field J G Field	9/9/98	PE		
Cog. Mgr.	K.M. Hall Kathleen M. Hall	9/14/98	QA		
QA			Safety		
Safety			Design		
Environ.			Environ.		
Other	J.W. Cammann JW Cammann	9/15/98	Other		
	R.J. Cash RJ Cash	9/15/98	DEPARTMENT OF ENERGY		
			Signature or a Control Number that tracks the Approval Signature		
	J.G. Kristofzski NWKul for JGK	9/15/98	ADDITIONAL		

S

Tank Characterization Report for Single-Shell Tank 241-SX-106

Jim G. Field
Lockheed Martin Hanford Corp., Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-87RL10930

EDT/ECN: ECN-643829 UC: 2070
Org Code: 74620 Charge Code: N4G4C
B&R Code: EW 3120074 Total Pages:

Key Words: Waste Characterization, Single-Shell Tank, SST, Tank 241-SX-106, Tank SX-106, SX-106, SX Farm, Tank Characterization Report, TCR, Waste Inventory, TPA Milestone M-44

Abstract: This document summarizes the information on the historical uses, present status, and the sampling and analysis results of waste stored in Tank 241-SX-106. This report supports the requirements of the Tri-Party Agreement Milestone M-44-15B.

9/16/98

Release Approval Date

DATE HANFORD
STA: 4 RELEASE ID: 58
SEP 16 1998

Release Stamp

Approved for Public Release

RECORD OF REVISION	(1) Document Number HNF-SD-WM-ER-645	Page 1

(2) Title
Tank Characterization Report for Single-Shell Tank 241-SX-106

CHANGE CONTROL RECORD

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release (5) Cog. Engr.	(6) Cog. Mgr. Date
0	(7) Initially released 08/28/97 on EDT-622677.	M.J. Kupfer	K.M. Hodgson
RS 1	Incorporate per ECN-643829.	J.G. Field	K.M. Hall
		J.G. Field 9/9/98	Kathleen M. Hall 9/14/98

A-7320-005 (08/91) WEF168

HNF-SD-WM-ER-645
Revision 1

Tank Characterization Report for Single-Shell Tank 241-SX-106

C. J. Lindquist
Los Alamos Technical Associates

S. R. Wilmarth
Lockheed Martin Hanford Corp.

L. J. Fergestrom
Technical Resources international, Inc.

M. D. Crippen
COGEMA Engineering Corporation

Date Published
September 1998

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

FLUOR DANIEL HANFORD, INC.

P.O. Box 1000
Richland, Washington

Hanford Management and Integration Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

CONTENTS

CONTENTS (Continued)

CONTENTS (Continued)

LIST OF FIGURES

LIST OF TABLES

LIST OF TABLES (Continued)

LIST OF TABLES (Continued)

LIST OF TABLES (Continued)

LIST OF TABLES (Continued)

LIST OF TABLES (Continued)

LIST OF TERMS

AES	atomic emission spectrocopy
ANOVA	analysis of variance
BPE	barometric pressure effect
Btu/hr	British thermal units per hour
Ci	curie
Ci/L	curies per liter
CI	confidence interval
cm	centimeter
df	degrees of freedom
DQO	data quality objective
DSC	differential scanning calorimetry
ft	feet
ft^3	cubic feet
g	gram
g/cm^3	grams per cubic centimeter
g/L	grams per liter
g/mL	grams per milliliter
HDW	Hanford defined waste
IC	ion chromatography
ICP	inductively coupled plasma (spectroscopy)
in.	inch
J/g	joules per gram
kg	kilogram
kgal	kilogallon
kL	kiloliter
kW	kilowatt
LFL	lower flammability limit
LL	lower limit
m	meter
m^3	cubic meters
M	moles per liter
mbar	millibars
mg/L	milligrams per liter
mL	milliliter
mm	millimeter
mol%	molecular percent
MOU	memorandum of understanding
n/a	not applicable
NA	not analyzed
N/A	not available
N/D	not determined

LIST OF TERMS (Continued)

NR	not requested
PHMC	Project Hanford Management Contractor
ppm	parts per million
ppmv	parts per million by volume
REDOX	reduction oxidation (facility)
RGS	retained gas sampler
RPD	relative percent difference
SAP	sampling and analysis plan
SHMS	standard hydrogen monitoring system
S1-SltCk	242-S Evaporator saltcake generated from 1973 to 1976
S2-SltSlr	242-S Evaporator saltcake generated from 1997 to 1980
SMM	supernatant mixing model
SMMS	SMM 242-S Evaporator saltcake
SMMS1	SMM 242-S Evaporator saltcake generated from 1973 until 1976
SMMS2	SMM 242-S Evaporator saltcake generated from 1977 until 1980
TGA	thermogravimetric analysis
TIC	total inorganic carbon
TLM	tank layer model
TOC	total organic carbon
TWRS	Tank Waste Remediation System
UL	upper limit
W	watt
WSTRS	Waste Status and Transaction Record Summary
wt%	weight percent
%	percent
°C	degrees Celsius
°F	degrees Fahrenheit
μCi/g	microcuries per gram
μCi/mL	microcuries per milliliter
μeq/g	microequivalents per gram
μg C/g	micrograms of carbon per gram
μg C/mL	micrograms of carbon per milliliter
μg/g	micrograms per gram
μg/mL	micrograms per milliliter
μmol/L	micromoles per liter

This page intentionally left blank.

1.0 INTRODUCTION

A major function of the Tank Waste Remediation System (TWRS) is to characterize waste in support of waste management and disposal activities at the Hanford Site. Analytical data from sampling and analysis and other available information about a tank are compiled and maintained in a tank characterization report. This report and its appendices serve as the tank characterization report for single-shell tank 241-SX-106.

The objectives of this report are 1) to use characterization data in response to technical issues associated with tank 241-SX-106 waste and 2) to provide a standard characterization of this waste in terms of a best-basis inventory estimate. Section 2.0 summarizes the response to technical issues, Section 3.0 shows the best-basis inventory estimate, Section 4.0 makes recommendations about the safety status of the tank and additional sampling needs. The appendices contain supporting data and information. This report supports the requirements of the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1997), Milestone M-44-15b, change request M-44-97-03 to "issue characterization deliverables consistent with the Waste Information Requirements Documents developed for 1998."

1.1 SCOPE

The characterization information in this report originated from sample analyses and known historical sources. The results of recent sample events will be used to fulfill the requirements of the data quality objectives (DQOs) and memoranda of understanding (MOUs) specified in Brown et al. (1997) for this tank. Other information can be used to support conclusions derived from these results.

Appendix A contains historical information for tank 241-SX-106 including surveillance information, records pertaining to waste transfers and tank operations, and expected tank contents derived from a process knowledge model. Appendix B summarizes recent sampling events (see Table 1-1), sample data obtained before 1989, and sampling results. Appendix C reports the statistical analysis and numerical manipulation of data used in issue resolution. Appendix D contains the evaluation to establish the best basis for the inventory estimate in this tank. Appendix E is a bibliography that resulted from an in-depth literature search of all known information sources applicable to tank 241-SX-106 and its respective waste types. The reports listed in Appendix E are available in the Lockheed Martin Hanford Corp. Tank Characterization and Safety Resource Center.

Table 1-1. Summary of Recent Sampling.

Sample/Date[1]	Phase	Location	Segmentation	% Recovery
Vapor sample (3/24/95)	Gas	Tank headspace, riser 14, 6.7 m (22 ft) below top of riser	n/a	n/a
Combustible gas test (10/13/97)	Gas	Tank headspace, riser 6, 6.1 m (20 ft) below top of riser	n/a	n/a
Push core 223 (10/13/97 to 10/30/97)	Solid/liquid	Riser 6	10 segments, upper half and lower half	0% to 100%
Push core 224 (12/2/97 to 12/11/97)	Solid/liquid	Riser 3	11 segments, upper half and lower half	68% to 100%

Notes:
n/a = not applicable

[1]Dates are in the mm/dd/yy format.

1.2 TANK BACKGROUND

Single-shell tank 241-SX-106 is located in the 200 West Area SX Tank Farm on the Hanford Site. It was constructed in 1953-1954 and is the last tank in a three-tank cascade series. From 1954 to 1963, the tank received supernatant, condensate waste, and sparge transfers from 241-SX tanks and other miscellaneous sources. In 1963, the tank received waste from the Reduction Oxidation (REDOX) facility. Between 1964 and 1975, the tank received waste from the Hanford Laboratory Operations and Pacific Northwest Laboratory. From 1954 to 1971, waste from the tank was sent to the S-021 crib.

From 1972 to 1979, waste was transferred into and out of tank 241-SX-106 in support of 242-S Evaporator operations. In 1980, the tank received a neutralized nitric acid/potassium permanganate (HNO_3/$KMnO_4$) solution to neutralize the waste and increase volume reduction. For most of its process history, the tank received flush water from miscellaneous sources (Agnew et al. 1997b). The tank was removed from service and labeled inactive in 1980 and was partially isolated in 1985.

Table 1-2 summarizes the description of tank 241-SX-106. The tank has a maximum storage capacity of 3,785 kL (1,000 kgal) and, as of May 31, 1998, contained an estimated 2,037 kL (538 kgal) of noncomplexed waste (Hanlon 1998). The tank is actively ventilated and is on the Watch List (Public Law 101-510) for flammable gas and organics issues.

Table 1-2. Description of Tank 241-SX-106.

TANK DESCRIPTION	
Type	Single-shell
Constructed	1953-1954
In service	1954
Diameter	22.9 m (75.0 ft)
Operating depth	9.14 m (30.0 ft)
Capacity	3,785 kL (1,000 kgal)
Bottom shape	Dish
Ventilation	Active
TANK STATUS	
Waste classification	Noncomplexed
Total waste volume[1]	2,037 kL (538 kgal)
Supernatant volume	231 kL (61 kgal)
Saltcake volume	1,760 kL (465 kgal)
Sludge volume	45 kL (12 kgal)
Drainable interstitial liquid volume	848 kL (224 kgal)
Waste surface level (05/31/98)[2]	503 cm (198 in.)
Temperature (05/31/97 to 05/31/98)	28.3 °C (82.9 °F) to 42.1 °C (107.8 °F)
Integrity	Sound
Watch List	Flammable gas and organic
Flammable Gas Facility Group	2
SAMPLING DATE	
Vapor sample	March 1995
Core sample	October and December 1997
SERVICE STATUS	
Declared inactive	October 1980
Partial interim isolation	June 1985
Interim stabilization/intrusion prevention	Not completed

Notes:
[1]Hanlon (1998)
[2]Dates are in the mm/dd/yy format.

2.0 RESPONSE TO TECHNICAL ISSUES

The following technical issues have been identified for tank 241-SX-106 (Brown et al. 1997).

- **Safety screening**: Does the waste pose or contribute to any recognized potential safety problems?
- **Flammable gas**: Does a possibility exist for releasing flammable gases into the headspace of the tank or releasing chemical or radioactive materials into the environment?
- **Organic complexant**: Does the possibility exist for a point source ignition in the waste followed by a propagation of the reaction in the solid/liquid phase of the waste?
- **Organic solvent**: Does an organic solvent pool exist that may cause a fire or ignition of organic solvents in entrained waste solids?

The sampling and analysis plan (SAP) (Jo 1997) specifies the types of sampling and analysis used to address the above issues. Data from the analysis of push core samples and tank vapor space measurements, along with available historical information, provided the means to respond to the technical issues. Sections 2.1 through 2.5 present the response. Data from the March 1995 vapor sample provided the means to address vapor screening issues. Appendix B contains sample and analysis data for tank 241-SX-106.

2.1 SAFETY SCREENING

The data needed to screen the waste in tank 241-SX-106 for potential safety problems are documented in *Tank Safety Screening Data Quality Objective* (Dukelow et al. 1995). These potential safety problems are exothermic conditions in the waste, flammable gases in the waste and/or tank headspace, and criticality conditions in the waste. Each condition is addressed separately below.

2.1.1 Exothermic Conditions (Energetics)

The first requirement outlined in the safety screening DQO (Dukelow et al. 1995) is to ensure that there are not sufficient exothermic constituents (organic) in tank 241-SX-106 to pose a safety hazard. Because of this requirement, energetics in tank 241-SX-106 waste were evaluated. The safety screening DQO required that the waste sample profile be tested for energetics every 24 cm (9.5 in.) to determine whether the energetics exceeded the safety threshold limit. The threshold limit for energetics is 480 J/g on a dry weight basis. Results obtained using differential scanning calorimetry (DSC) indicated that no sample from tank 241-SX-106 had mean exothermic reactions (on a dry weight basis) exceeding the safety screening DQO limit. The maximum dry weight exotherm observed was 269 J/g. The maximum upper limit to a 95 percent confidence interval on the mean was 338 J/g from core 224, segment 11, upper half. Therefore, energetic behavior is not a concern for this tank. Appendix C contains the method used to calculate confidence limits.

2.1.2 Flammable Gas

Headspace measurements were taken before obtaining the October/December 1997 push core samples. No flammable gas was detected in the tank headspace (0 percent of the lower flammability limit [LFL]). This is well below the safety screening limit of 25 percent of the LFL. The March 1995 vapor samples also showed a low flammable gas concentration (<98 ppmv). Data for the combustible gas headspace gas tests (sniff tests) and the March 1995 vapor samples are presented in Appendix B.

2.1.3 Criticality

The safety screening DQO threshold for criticality, based on the total alpha activity, is 1 g/L. Because total alpha activity is measured in μCi/g instead of g/L, the 1 g/L limit is converted into units of μCi/g by assuming that all alpha decay originates from ^{239}Pu. The safety threshold limit is 1 g ^{239}Pu per liter of waste. Assuming that all alpha is from ^{239}Pu and using the maximum solids density of 1.79 g/mL, this limit corresponds to 34.4 μCi/g of total alpha activity for solids. The maximum total alpha activity result was 1.26 μCi/g (core 224, segment 9, lower half). The maximum upper limit to a 95 percent confidence interval on the mean was 1.32 μCi/g (core 224, segment 9, lower half), indicating that the potential for a criticality event is extremely low. Therefore, criticality is not a concern for this tank. Appendix C contains the method used to calculate confidence limits.

2.2 FLAMMABLE GAS DATA QUALITY OBJECTIVE

The requirements to support the flammable gas issue are documented in the *Data Quality Objective to Support Resolution of the Flammable Gas Safety Issue* (Bauer and Jackson 1998). This DQO has been extended to apply to all tanks. Analyses and evaluations will change according to program needs until this issue is resolved. The unreviewed safety question for flammable gas safety issues is expected to be closed in fiscal year 1998, and final resolution of the flammable gas safety issue is expected to be completed by September 30, 2001 (Johnson 1997). These dates are consistent with Milestones M-40-09 and M-40-00 (Ecology et al. 1997) to close out the unreviewed safety question for Watch List tanks and to resolve all flammable gas safety issues for high priority tanks.

Retained gas sampler (RGS) samples were taken and analyzed to address flammable gas issues for tank 241-SX-106 (Bauer and Jackson 1998). No specific notification limits or "acceptance levels" have been determined to meet this DQO. The results of RGS testing are reported in Mahoney et al. (1998) and summarized in Appendix B of this document.

An increase of approximately 46 cm (18 in.) has been observed in the tank surface-level measurements since 1981. This increase is attributed to the retained gases in the tank. Observations from the recent core sample indicate the thickness of the top layer of liquid is between four and five segments at risers 6 and 3. Most of the material is salt or salt slurry, though sludge or sludge/salt slurry is present in the range of segments 6 through 8 of both risers.

Retained gas sampler samples were requested from riser 6, segments 6, 9, and 11; and riser 3, segments 2, 4, 7, and 10. During the retrieval of segment 11 from riser 6, the grapple cable broke requiring the drill string and sampler to be removed manually. The x-rays of the sampler indicated that it contained lithium bromide solution and air with no sample material present.

Retained gas sampler sampling showed that the insoluble retained gases in tank 241-SX-106 had an average composition of 19 mol% nitrogen, 47 mol% hydrogen, 22 mol% nitrous oxide, and 11 mol% ammonia, with minor components including methane and other hydrocarbons. The measured ammonia levels were unusually high, falling between 30,000 $\pm$ 13,000 and 130,000 $\pm$ 120,000 μmol/L of waste (0.35 weight percent NH_3 in the liquid). The RGS samples retained void fractions between 0.095 and 0.37, with much of the high-solids layer (three samples) showing gas volumes fractions $<$0.30. The gas inventory, based on the RGS data, is 360 $\pm$ 180 m^3.

Tank 241-SX-106 is equipped with a standard hydrogen monitoring system (SHMS) for the collection of vapor-phase data that support resolution of flammable gas issues. The SHMS vapor data are posted to the tank characterization database (LMHC 1998).

2.3 ORGANIC COMPLEXANT

The data required to support the issue of organic complexants are documented in *Memorandum of Understanding for the Organic Complexant Safety Issue Data Requirements* (Schreiber 1997). Energetics by DSC, moisture, and total organic carbon (TOC) analyses were conducted to address the organic complexant issue.

Several exotherms were observed but did not exceed the limit of 480 J/g (dry weight). The TOC results for the persulfate oxidation analysis ranged from 0.18 to 1.13 percent dry weight. Furnace oxidation TOC analysis was required for those samples for which the TOC by persulfate did not account for at least 75 percent of the exothermic energy. This occurred in one sample (core 224, segment 11, upper half). Statistical analysis of the TOC measurements indicates that there is more than 95 percent confidence that 95 percent of the waste is below 4.5 weight percent TOC on a dry weight basis (Meacham et al. 1998). Consequently, the tank waste has an acceptably low probability of propagation and is classified as "Safe" for this issue.

2.4 ORGANIC SOLVENT SAFETY SCREENING

The data required to support the organic solvent safety screening issues are documented in the *Data Quality Objective to Support Resolution of the Organic Solvent Safety Issue* (Meacham et al. 1997). The DQO requires tank headspace samples be analyzed for total nonmethane organic compounds to determine whether an organic extractant pool exists in the tank. The purpose of this assessment is to ensure that an organic solvent pool fire or ignition of organic solvents cannot occur.

Specific analyses for total nonmethane organic hydrocarbon were not conducted in this tank (Huckaby and Bratzel 1995). The size of an organic extractant pool can be determined by the organics program, based on the analyses that were conducted for the March 1995 vapor sampling and on the tank headspace temperature and ventilation rate. However, the organic program has determined that even if an organic solvent pool does exist, the consequence of a fire or ignition of organic solvents is below risk evaluation guidelines for all of the tanks (Brown et al. 1998). Consequently, additional vapor analyses are not required for this tank. The organic solvent issue is expected to be closed for all tanks in fiscal year 1998.

2.5 OTHER TECHNICAL ISSUES

Vapor samples were taken in March 1995 to address the *Data Quality Objectives for Tank Hazardous Vapor Safety Screening* (Osborne and Buckley 1995). However, this is no longer an issue because headspace vapor (sniff) tests are required for the safety screening DQO (Dukelow et al. 1995), and the toxicity issue was closed for all tanks (Hewitt 1996). Vapor sample results are discussed in Appendix B.

A factor in assessing tank safety is the heat generation and temperature of the waste. Heat is generated in the tanks from radioactive decay. An estimate of the tank heat load based on the 1997 core sample event was not possible because radionuclide analyses were not required. However, the heat load estimate based on the tank process history was 4,310 W (14,700 Btu/hr) (Agnew et al. 1997a). The heat load estimate based on the tank headspace temperature was 3,180 W (10,840 Btu/hr) (Kummerer 1995). Both of these estimates are quite low and are well below the limit of 11,700 W (40,000 Btu/hr) that separates high- and low-heat-load tanks (Smith 1986).

2.6 SUMMARY

The results of all analyses performed to address potential safety issues showed that primary analyte(s) did not exceed safety decision threshold limits. All requirements for the safety screening and organic complexant issue were met.

Retained gas sampler measurements showed a high volume of retained gases in the samples analyzed. The average composition is 47 mol% hydrogen, 22 mol% nitrous oxide, 19 mol% nitrogen, and 11 mol% ammonia, with minor components including methane and other hydrocarbons. The gas inventory, based on the RGS data, is 360 $\pm$ 180 m^3. The gas inventory predicted by the barometric pressure effect method is 190 $\pm$ 30 m^3. The difference in these gas inventory estimates may be caused by localized high-gas regions that do not extend over the entire tank.

Vapor samples taken in March 1995 met the requirements of the organic solvent safety screening DQO. Sample results are summarized in Table 2-1.

Table 2-1. Summary of Technical Issues. (2 sheets)

Issue	Sub-issue	Result
Safety screening	Energetics	All exotherms were $\leq$269 J/g, far below the upper limit of 480 J/g.
	Flammable gas	Vapor measurement was reported as 0 percent of LFL (combustible gas meter).
	Criticality	All analyses were less than 2 μCi/g, well below the total alpha limit of 34.4 μCi/g.
Flammable gas	Mechanisms for generation, retention, and release Waste models	28% of the solid waste volume consisted of retained gases (190 $\pm$ 30 m^3) with 47 mol% hydrogen content. Waste contained high ammonia concentration. Preliminary assessments of flammable gas generation, retention, and release mechanisms and results of waste behavior modeling are reported in Mahoney et al. (1998). Additional evaluations to assess potential impacts and waste behavior in tank 241-SX-106 are in progress.

Table 2-1. Summary of Technical Issues. (2 sheets)

Issue	Sub-issue	Result
Organic complexants[1]	Safety categorization (safe)	Low DSC and TOC were reported, with no visible separable organic layer.
Organic solvents[1]	Solvent pool size	Total nonmethane hydrocarbon was not measured.

Note:
[1]This issue is expected to be closed in fiscal year 1998.

3.0 BEST-BASIS STANDARD INVENTORY ESTIMATE

Information about chemical, radiological, and/or physical properties is used to perform safety analyses, engineering evaluations, and risk assessments associated with waste management activities as well as regulatory issues. These activities include overseeing tank farm operations and identifying, monitoring, and resolving safety issues associated with these operations and with the tank wastes. Disposal activities involve designing equipment, processes, and facilities for retrieving wastes and processing them into a form that is suitable for long-term storage/disposal.

Chemical and radiological inventory information are generally derived using three approaches: 1) component inventories are estimated using the results of sample analyses; 2) component inventories are predicted using the Hanford defined waste (HDW) model based on process knowledge and historical information; or 3) a tank-specific process estimate is made based on process flowsheets, reactor fuel data, essential material usage, and other operating data.

An effort is underway to provide waste inventory estimates that will serve as standard characterization source terms for the various waste management activities (Hodgson and LeClair 1996). As part of this effort, an evaluation of chemical information for tank 241-SX-106 was performed, and a best-basis inventory was established. This work, detailed in the following sections, follows the methodology that was established by the standard inventory task. The following information was used in the evaluation:

- Analytical data from the 1997 push-mode core sampling event (Appendix B)
- Inventory estimates generated for this tank from the HDW model (Agnew et al. 1997a).

Based on this engineering assessment, a best-basis inventory was developed for tank 241-SX-106 using the 1997 core sampling analytical data. Where analytical data were not available, the HDW model inventory estimates reported by Agnew et al. (1997a) were used as the best basis for this tank.

Best-basis tank inventory values are derived for 46 key radionuclides (as defined in Section 3.1 of Kupfer et al. 1997), all decayed to a common report date of January 1, 1994. Often, waste sample analyses have only reported ^{90}Sr, ^{137}Cs, $^{239/240}$Pu, and total uranium, or total beta and total alpha, while other key radionuclides such as ^{60}Co, ^{99}Tc, ^{129}I, ^{154}Eu, ^{155}Eu, and ^{241}Am, have been infrequently reported. Therefore, it has been necessary to derive most of the 46 key radionuclides by computer models. These models estimate radionuclide activity in batches of reactor fuel, account for the split of radionuclides to various separations plant waste streams, and track their movement with tank waste transactions. (These computer models are described in Kupfer et al. 1997, Section 6.1, and in Watrous and Wootan 1997.)

Model-generated values for radionuclides in any of 177 tanks are reported in the HDW Revision 4 model results (Agnew et al. 1997a). The best-basis value for any one analyte may be either a model result or a sample or engineering assessment-based result, if available.

The best-basis inventory estimate for tank 241-SX-106 is presented in Tables 3-1 and 3-2. The mercury inventory was specified in Simpson (1998). The inventory of strontium was calculated from the ^{90}Sr activity. The inventory of ^{90}Sr was based on a weighted average of the template estimates for waste types SMMS1 (supernatant mixing model [SMM] 242-S Evaporator saltcake generated from 1973 until 1976) and SMMS2 (SMM 242-S Evaporator saltcake generated from 1977 until 1980) from Sasaki et al. (1998). The inventory of ^{137}Cs was based on the heat load calculated from the difference between the total heat load estimate of 3,180 W (10,840 Btu/hr) provided by Kummerer (1995) and the heat load attributed to ^{90} Sr.

The inventory values reported in Tables 3-1 and 3-2 are subject to change. Refer to the Tank Characterization Database for the most current inventory values.

Table 3-1. Best-Basis Inventory Estimates for Nonradioactive Components in Tank 241-SX-106 (Effective May 31, 1998). (2 sheets)

Analyte	Total Inventory (kg)	Basis (S, M, E, or C)[1]	Comment
Al	57,500	S	
Bi	0	E	Not expected based on process history
Ca	278	S/E	Solids only
Cl	21,700	S	
TIC as CO_3	62,000	S	
Cr	7,140	S	
F	1,240	S	
Fe	631	S/E	Solids only
Hg	0	E	Simpson (1998)
K	5,240	S	
La	55	S/E	Upper bounding limit
Mn	660	S/E	Solids only
Na	5.46E+05	S	
Ni	0	E	Not expected based on process history
NO_2	2.40E+05	S	

Table 3-1. Best-Basis Inventory Estimates for Nonradioactive Components in Tank 241-SX-106 (Effective May 31, 1998). (2 sheets)

Analyte	Total Inventory (kg)	Basis (S, M, E, or C)[1]	Comment
NO_3	6.99E+05	S	
OH_{TOTAL}	1.71E+05	C	
Pb	120	S/E	Upper bounding limit
PO_4	28,400	S	
Si	442	S	
SO_4	14,400	S	
Sr	4.00	E	Calculated from ^{90}Sr assuming that ^{90}Sr is 30 wt% of total strontium
TOC	9,920	S	
U_{TOTAL}	553	S/E	Upper bounding limit
Zr	18	S/E	Solids only

Notes:

TIC = total inorganic carbon

[1]S = sample based (see Appendix B), M = HDW model based (Agnew et al. 1997a), E =engineering assessment based, and C = calculated by charge balance; includes oxides as hydroxides, not including CO_3, NO_2, NO_3, PO_4, SO_4, and SiO_3.

Table 3-2. Best-Basis Inventory Estimates for Radioactive Components in Tank 241-SX-106 Decayed to January 1, 1994 (Effective May 31, 1998). (4 sheets)

Analyte	Total Inventory (Ci)	Basis (S, M, or E)[1]	Comment
^{3}H	513	M	
^{14}C	73.7	M	
^{59}Ni	4.80	M	
^{60}Co	81.6	M	
^{63}Ni	470	M	
^{79}Se	7.35	M	

Table 3-2. Best-Basis Inventory Estimates for Radioactive Components in Tank 241-SX-106 Decayed to January 1, 1994 (Effective May 31, 1998). (4 sheets)

Analyte	Total Inventory (Ci)	Basis (S, M, or E)[1]	Comment
^{90}Sr	1.70E+05	E	Based on the template estimates for waste types SMMS1 saltcake and SMMS2 saltcake from Sasaki et al. (1998)
^{90}Y	1.70E+05	E	Based on the ^{90}Sr activity
^{93}Zr	36.1	M	
^{93m}Nb	26.2	M	
^{99}Tc	525	M	
^{106}Ru	0.0145	M	
^{113m}Cd	189	M	
^{125}Sb	351	M	
^{126}Sn	11.1	M	
^{129}I	1.01	M	
^{134}Cs	5.57	M	
^{137}Cs	4.71E+05	E	Based on the heat load calculated from the difference between the total heat load estimate from Kummerer (1995) and the heat load attributed to ^{90}Sr
^{137m}Ba	4.45E+05	E	Based on 0.946 of the ^{137}Cs activity
^{151}Sm	25,900	M	
^{152}Eu	8.49	M	
^{154}Eu	1,330	M	
^{155}Eu	501	M	
^{226}Ra	3.15E-04	M	
^{227}Ac	0.00199	M	
^{228}Ra	0.307	M	
^{229}Th	0.00720	M	
^{231}Pa	0.00913	M	
^{232}Th	0.0204	M	
^{232}U	0.181	S/E/M	Based on ICP uranium sample result ratioed to HDW estimates for uranium isotopes

Table 3-2. Best-Basis Inventory Estimates for Radioactive Components in Tank 241-SX-106 Decayed to January 1, 1994 (Effective May 31, 1998).
(4 sheets)

Analyte	Total Inventory (Ci)	Basis (S, M, or E)[1]	Comment
^{233}U	0.693	S/E/M	Based on ICP uranium sample result ratioed to HDW estimates for uranium isotopes
^{234}U	0.203	S/E/M	Based on ICP uranium sample result ratioed to HDW estimates for uranium isotopes
^{235}U	0.00823	S/E/M	Based on ICP uranium sample result ratioed to HDW estimates for uranium isotopes
^{236}U	0.00636	S/E/M	Based on ICP uranium sample result ratioed to HDW estimates for uranium isotopes
^{237}Np	1.92	M	
^{238}Pu	6.45	S/E/M	Based on total alpha activity sample result ratioed to HDW estimates for alpha isotopes
^{238}U	0.185	S/E/M	Based on ICP uranium sample result ratioed to HDW estimates for uranium isotopes
^{239}Pu	222	S/E/M	Based on total alpha activity sample result ratioed to HDW estimates for alpha isotopes
^{240}Pu	37.6	S/E/M	Based on total alpha activity sample result ratioed to HDW estimates for alpha isotopes
^{241}Am	269	S/E/M	Based on total alpha activity sample result ratioed to HDW estimates for alpha isotopes
^{241}Pu	436	S/E/M	Based on total alpha activity sample result ratioed to HDW estimates for alpha isotopes
^{242}Cm	0.689	S/E/M	Based on total alpha activity sample result ratioed to HDW estimates for alpha isotopes
^{242}Pu	0.00239	S/E/M	Based on total alpha activity sample result ratioed to HDW estimates for alpha isotopes
^{243}Am	0.00932	S/E/M	Based on total alpha activity sample result ratioed to HDW estimates for alpha isotopes
^{243}Cm	0.0638	S/E/M	Based on total alpha activity sample result ratioed to HDW estimates for alpha isotopes

Table 3-2. Best-Basis Inventory Estimates for Radioactive Components in Tank 241-SX-106 Decayed to January 1, 1994 (Effective May 31, 1998).
(4 sheets)

Analyte	Total Inventory (Ci)	Basis (S, M, or E)[1]	Comment
^{244}Cm	0.630	S/E/M	Based on total alpha activity sample result ratioed to HDW estimates for alpha isotopes

Notes:

ICP = inductively coupled plasma (spectroscopy)

[1]S = sample-based (see Appendix B), M =HDW model based (Agnew et al. 1997a), and E = engineering assessment based.

4.0 RECOMMENDATIONS

Push-mode core samples (October through December 1997) and vapor samples (March 1995) were taken to satisfy the applicable issues associated with tank 241-SX-106. Analytical results from the core sample were within the prescribed limits of the safety screening and organic complexant DQOs. Retained gas samples were taken to evaluate flammable gas issues. Results of these tests are presented in Appendix B. The RGS results and gas bubble retention test results (not available at the time this tank characterization report was written) are being evaluated to further address the flammable gas DQO. The sampling and analysis activities performed for tank 241-SX-106 have met all requirements for all applicable DQO documents except for the organic solvent issue.

Vapor samples showed that ammonia is the only toxic vapor of concern and the LFL in the tank headspace is <1 percent. Specific analyses for total nonmethane organic hydrocarbon were not conducted in this tank (Huckaby and Bratzel 1995). However, the organic program has determined that even if an organic solvent pool does exist, the consequence of a fire or ignition of organic solvents is below risk evaluation guidelines for all of the tanks (Brown et al. 1998). Consequently, additional vapor analyses are not required for this tank. The organic solvent issue is expected to be closed for all tanks in fiscal year 1998.

Table 4-1 summarizes the Project Hanford Management Contractor (PHMC) TWRS program review status and acceptance of the sampling and analysis results reported in this tank characterization report. All issues required to be addressed by sampling and analysis are listed in column 1 of Table 4-1. Column 2 indicates by "yes" or "no" whether issue requirements were met by the sampling and analysis performed. Column 3 indicates concurrence and acceptance by the program in PHMC TWRS that is responsible for the applicable issue. A "yes" in column 3 indicates that no additional sampling or analyses are needed. Conversely, "no" indicates additional sampling or analysis may be needed to satisfy issue requirements.

Table 4-1. Acceptance of Tank 241-SX-106 Sampling and Analysis.

Issue	Sampling and Analysis Performed	Program[1] Acceptance
Safety screening DQO	Yes	Yes
Flammable gas DQO	Yes	Yes
Organic complexant MOU[2]	Yes	Yes
Organic solvent DQO[2]	Yes	Yes

Notes:

[1]PHMC TWRS program office
[2]The organic complexant and organic solvent safety issues are expected to be closed in fiscal year 1998.

Table 4-2 summarizes the status of PHMC TWRS program review and acceptance of the evaluations and other characterization information contained in this report. Column 1 lists the different evaluations performed in this report. Column 2 shows whether issue evaluations have been completed or are in progress. Column 3 indicates concurrence and acceptance with the evaluation by the program in PHMC TWRS that is responsible for the applicable issue. A "yes" indicates that the evaluation is completed and meets all issue requirements.

Table 4-2. Acceptance of Evaluation of Characterization Data and Information for Tank 241-SX-106.

Issue	Evaluation Performed	TWRS[1] Program Acceptance
Safety screening DQO	Yes	Yes
Flammable gas DQO[2]	(in progress)	N/D
Organic complexant MOU[3]	Yes	Yes
Organic solvent DQO[3]	Yes	Yes

Notes:
N/D = not determined

[1]PHMC TWRS Program Office

[2]The flammable gas unreviewed safety question is expected to be closed in fiscal year 1998, final closure of this issue for all tanks is scheduled for fiscal year 2002.

[3]The organic complexant and organic solvent safety issues are expected to be closed in fiscal year 1998.

5.0 REFERENCES

Agnew, S. F., J. Boyer, R. A. Corbin, T. B. Duran, J. R. Fitzpatrick, K. A. Jurgensen, T. P. Ortiz, and B. L. Young, 1997a, *Hanford Tank Chemical and Radionuclide Inventories: HDW Model Rev. 4*, LA-UR-96-3860, Los Alamos National Laboratory, Los Alamos, New Mexico.

Agnew, S. F., R. A. Corbin, T. B. Duran, K. A. Jurgensen, T. P. Ortiz, and B. L. Young, 1997b, *Waste Status and Transaction Record Summary (WSTRS) Rev. 4*, LA-UR-97-311, Los Alamos National Laboratory, Los Alamos, New Mexico

Bauer, R. E., and L. P. Jackson, 1998, *Data Quality Objective to Support Resolution of the Flammable Gas Safety Issue*, HNF-SD-WM-DQO-004, Rev. 3A, DE&S Hanford, Inc., for Fluor Daniel Hanford, Inc., Richland, Washington.

Brown, T. M., J. W. Hunt, and L. J. Fergestrom, 1997, *Tank Characterization Technical Sampling Basis*, HNF-SD-WM-TA-164, Rev. 3, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

Brown, T. M., J. W. Hunt, and L. J. Fergestrom, 1998, *Tank Characterization Technical Sampling Basis*, HNF-SD-WM-TA-164, Rev. 4, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc. Richland, Washington.

Dukelow, G. T., J. W. Hunt, H. Babad, and J. E. Meacham, 1995, *Tank Safety Screening Data Quality Objective*, WHC-SD-WM-SP-004, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

Ecology, EPA, and DOE, 1997, *Hanford Federal Facility Agreement and Consent Order,* as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

Hanlon, B. M., 1998, *Waste Tank Summary Report for Month Ending May 31, 1998,* HNF-EP-0182-122, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

Hewitt, E. R., 1996, *Tank Waste Remediation System Resolution of Potentially Hazardous Vapor Issues*, WHC-SD-TWR-RPT-001, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Hodgson, K. M. and M. D. LeClair, 1996, *Work Plan for Defining a Standard Inventory Estimate for Wastes Stored in Hanford Site Underground Tanks,* WHC-SD-WM-WP-311, Rev. 1, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

Huckaby, J. L. and D. R. Bratzel, 1995, *Tank 241-SX-106 Headspace Gas and Vapor Characterization Results for Samples Collected in March 1995*, WHC-SD-WM-ER-460, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Jo, J., 1997, *Tank 241-SX-106 Push Mode Core Sampling and Analysis Plan*, HNF-SD-WM-TSAP-148, Rev. 1, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

Johnson, G. D., 1997, *Strategy for Resolution of the Flammable Gas Safety Issue*, HNF-SD-WM-ER-680, Rev. 0, DE&S Hanford, Inc., for Fluor Daniel Hanford, Inc., Richland, Washington.

Kummerer, M., 1995, *Heat Removal Characteristics of Waste Storage Tanks*, WHC-SD-WM-SARR-010, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Kupfer, M. J., A. L. Boldt, B. A. Higley, K. M. Hodgson, L. W. Shelton, B. C. Simpson, R. A. Watrous, M. D. LeClair, G. L. Borsheim, R. T. Winward, R. M. Orme, N. G. Colton, S. L. Lambert, D. E. Place, and W. W. Schulz, 1997, *Standard Inventories of Chemicals and Radionuclides in Hanford Site Tank Wastes*, HNF-SD-WM-TI-740, Rev. 0A, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

LMHC, 1998, Tank Characterization Database, May 31, 1998, Internet at http://twins.pnl.gov:8001/TCD/main.html, Lockheed Martin Hanford Corp., Richland, Washington.

Mahoney, L. A., Z. I. Antoniak, and J. M. Bates, 1998, *Preliminary Retained Gas Sampler Measurement Results for Hanford Waste Tank 241-SX-106*, TWS98.33, Pacific Northwest National Laboratory, Richland, Washington.

Meacham, J. E., D. L. Banning, M. R. Allen, and L. D. Muhlestein, 1997, *Data Quality Objective to Support Resolution of the Organic Solvent Safety Issue*, HNF-SD-WM-DQO-026, Rev. 0, DE&S Hanford, Inc., for Fluor Daniel Hanford, Inc., Richland, Washington.

Meacham, J. E., W. L. Cowley, A. B. Webb, N. W. Kirch, J. A. Lechelt, D. A. Reynolds, L. A. Stauffer, D. B. Bechtold, D. M. Camaioni, F. Gao, R. T. Hallen, P. G. Heasler, J. L. Huckaby, R. D. Scheele, C. S. Simmons, J. J. Toth, and L. M. Stock, 1998, *Organic Complexant Topical Report*, HNF-SD-WM-CN-058, Rev. 2, DE&S Hanford, Inc., for Fluor Daniel Hanford, Inc., Richland, Washington.

Osborne, J. W., and L. L. Buckley, 1995, *Data Quality Objectives for Tank Hazardous Vapor Safety Screening*, WHC-SD-WM-DQO-002, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

Public Law 101-510, 1990, "Safety Measures for Waste Tanks at Hanford Nuclear Reservation," Section 3137 of *National Defense Authorization Act for Fiscal Year 1991*.

Sasaki, L. M., S. R. Wilmarth, and T. T. Tran, 1998, *Tank Characterization Report for Single-Shell Tank 241-U-103*, HNF-SD-WM-ER-712, Rev. 1, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

Schreiber, R. D., 1997, *Memorandum of Understanding for the Organic Complexant Safety Issue Data Requirements*, HNF-SD-WM-RD-060, Rev. 0, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

Simpson, B. C., 1998, *Best Basis Inventory Change Package for Reconciliation of Mercury Values, Change Package 7*, (internal memorandum 7A120-98-005 to J. W. Cammann, February 26), Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

Smith, D. A., 1986, *Single-Shell Tank Isolation Safety Analysis Report*, WHC-SD-WM-SAR-006, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

Watrous, R. A., and D. W. Wootan, 1997, *Activity of Fuel Batches Processed Through Hanford Separations Plants, 1944 Through 1989*, HNF-SD-WM-TI-794, Rev. 0, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

This page intentionally left blank.

APPENDIX A

HISTORICAL TANK INFORMATION

This page intentionally left blank.

APPENDIX A

HISTORICAL TANK INFORMATION

Appendix A describes tank 241-SX-106 based on historical information. For this report, historical information includes information about the fill history, waste types, surveillance, or modeling data about the tank. This information is necessary for providing a balanced assessment of sampling and analytical results.

This appendix contains the following information:

- **Section A1.0**: Current tank status, including the current waste levels and the tank stabilization and isolation status

- **Section A2.0**: Information about the tank design

- **Section A3.0**: Process knowledge about the tank, the waste transfer history, and the estimated contents of the tank based on modeling data

- **Section A4.0**: Surveillance data for tank 241-SX-106, including surface-level readings, temperatures, and a description of the waste surface based on photographs

- **Section A5.0**: References for Appendix A.

A1.0 CURRENT TANK STATUS

As of May 31, 1998, tank 241-SX-106 contained an estimated 2,037 kL (538 kgal) of noncomplexed waste (Hanlon 1998). The waste volumes were estimated using a Food Instrument Corporation surface-level gauge, photographic evaluation, and sludge level measurement device. Table A1-1 shows the volumes of the waste phases found in the tank.

Tank 241-SX-106 is out of service as are all single-shell tanks. This tank is categorized as sound with partial interim isolation completed in 1985. The tank is actively ventilated and is on the Watch List (Public Law 101-510) for flammable gas and organics issues.

Table A1-1. Tank Contents Status Summary.[1]

Waste Type	kL (kgal)
Total waste	2,037 (538)
Supernatant	231 (61)
Sludge	45 (12)
Saltcake	1,760 (465)
Drainable interstitial liquid	848 (224)
Drainable liquid remaining	1,080 (285)
Pumpable liquid remaining	999 (264)

Note:
[1]Hanlon (1998).

A2.0 TANK DESIGN AND BACKGROUND

The SX Tank Farm was constructed between 1953 and 1954 in the 200 West Area of the Hanford Site. The SX Tank Farm contains fifteen 100-series tanks. These tanks have a maximum capacity of 3,785 kL (1,000 kgal) and a diameter of 23 m (75 ft). Built according to the third-generation design, the 241-SX Tank Farm was designed for self-boiling waste (for a 5- to 10-year boiling period) with a maximum fluid temperature of 121 °C (250 °F) (Leach and Stahl 1997). Because the tanks were designed specifically for boiling waste, airlift circulators were installed to control waste temperatures.

Tank 241-SX-106 entered service in 1954 and is third in a three-tank cascading series. These tanks are connected by a 7.6-cm (3-in.) cascade line. The cascade overflow height is approximately 9.47 m (373 in.) from the tank bottom and 30 cm (1 ft) below the top of the steel liner. These single-shell tanks in the 241-SX Tank Farm are constructed of 61-cm (2-ft)-thick, reinforced concrete with a 0.953-cm (0.375 in.) mild carbon steel liner on the bottom and sides and a 38-cm (1.25-ft)- thick, domed concrete top. These tanks have a dished bottom with an operating depth of 9.14 m (30 ft). The tanks are covered with approximately 2.21 m (7.25 ft) of overburden.

Tank 241-SX-106 has 12 risers according to the drawings and engineering change notices. The risers range in diameter from 100 mm (4 in.) to 1.1 m (42 in.). Table A2-1 shows numbers, diameters, and descriptions of the risers. A plan view that depicts the riser and nozzle configuration is shown as Figure A2-1. Figure A2-2 is a tank cross section showing the approximate waste level along with a schematic of the tank equipment.

Table A2-1. Tank 241-SX-106 Risers.[1]

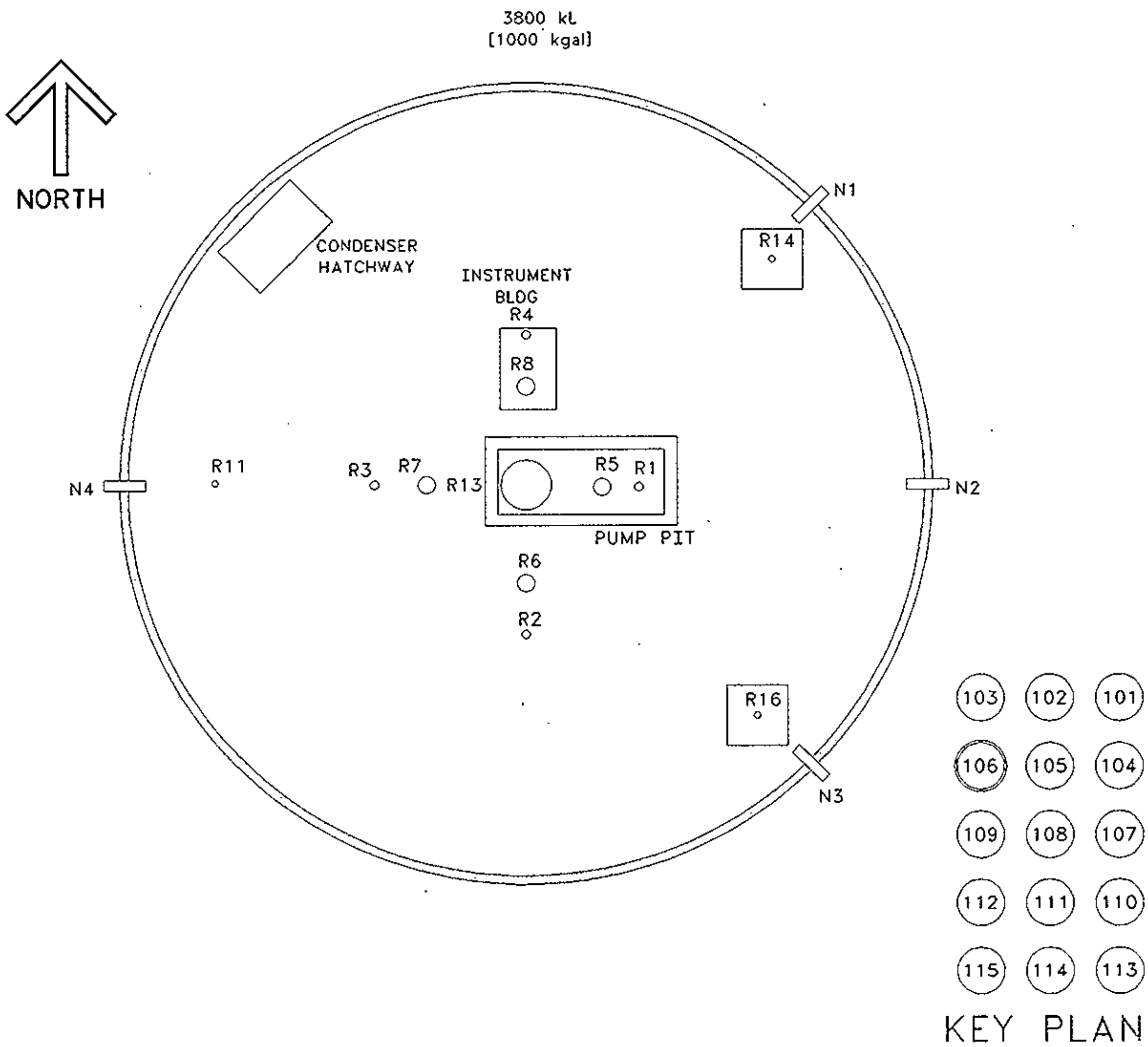
Number	Diameter (in.)	Description and Comments
R1	4	Connection nozzle
R2	4	Blind flange (benchmark Change Engineering Order 36903; December 11, 1986)
R3	4	Food Instrument Corporation gauge (ENRAF[2] 854; Engineering Change Notice 612693; August 3, 1994)
R4	4	Dome riser
R5	12	Salt well screen and pump
R6	12	B-222 observation port
R7	12	Blind flange [benchmark Change Engineering Order 36903; December 11, 1986)
R8	12	Condensate pump
R11	4	Breather filter (benchmark Change Engineering Order 36903; December 11, 1986) (standard hydrogen monitor system with air filter W-369-012; December 20, 1994)
R13	42	Distributor riser
R14	4	B-436 liquid observation well
R16	4	Temperature probe
N1	3	Auxiliary fill
N2	4	Overflow inlet
N3	8	Spare, capped
N4	4	Overflow outlet

Note:

[1]Alstad (1993), Lipnicki (1997), Tran (1993), and Vitro (1985)

[2]ENRAF is a trademark of ENRAF Corporation, Houston, Texas.

Figure A2-1. Riser Configuration for Tank 241-SX-106.



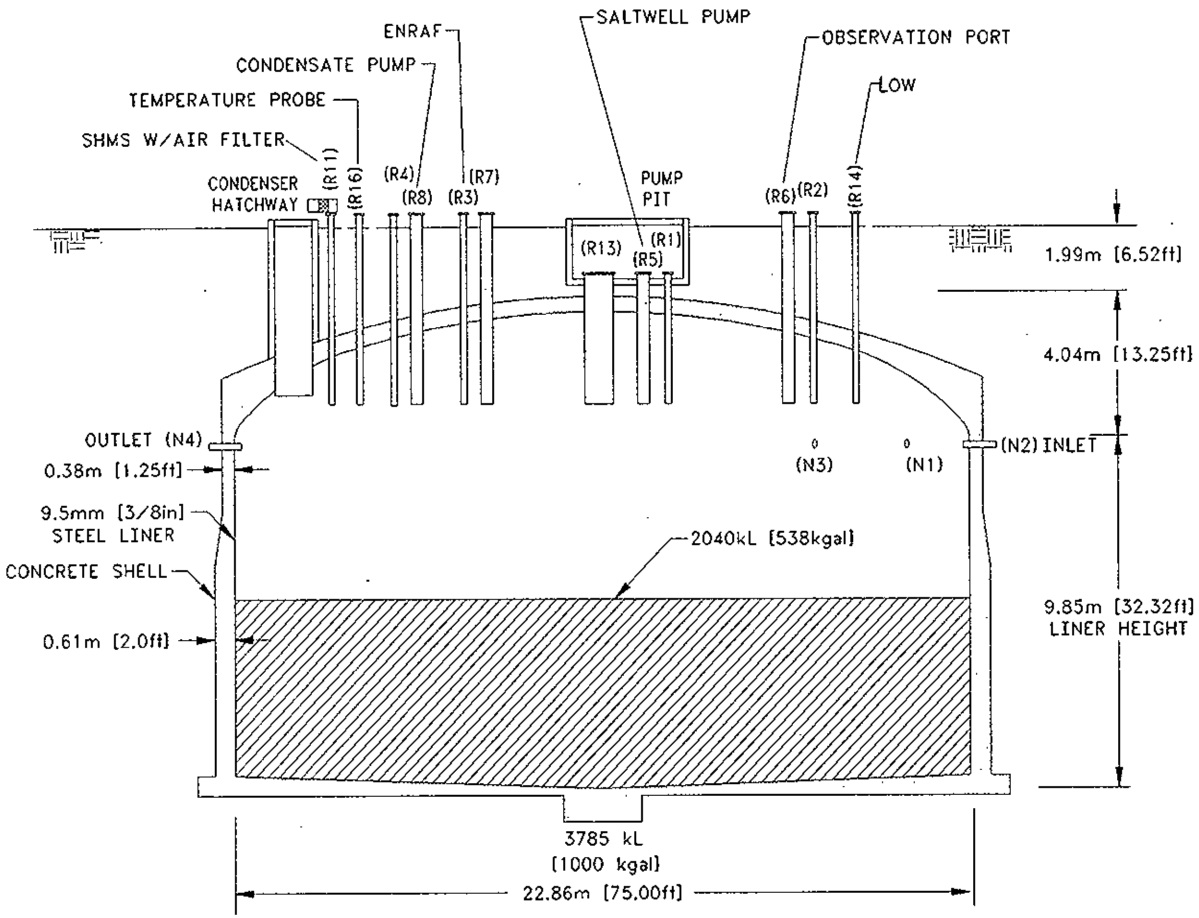


Figure A2-2. Tank 241-SX-106 Cross Section and Schematic.

A3.0 PROCESS KNOWLEDGE

The sections below provide information about the transfer history of tank 241-SX-106, describe the process wastes that made up the transfers, and estimate the current tank contents based on transfer history.

A3.1 WASTE TRANSFER HISTORY

Table A3-1 summarizes the waste transfer history of tank 241-SX-106 (Agnew et al. 1997b). Waste, consisting of flush water from miscellaneous sources, was initially added to tank 241-SX-106 in the third quarter of 1954. From the fourth quarter of 1954 to the fourth quarter of 1963, the tank received condensate waste from various 241-SX tanks and miscellaneous sources. Waste was transferred from the tank to the S-021 crib from the fourth quarter of 1954 to the third quarter of 1971. From the first quarter of 1956 to the second quarter of 1963, the tank received flush water from miscellaneous sources. From the second to the fourth quarters of 1957, supernatant waste was sent to tank 241-SX-104. From the fourth quarter of 1958 to the third quarter of 1960, the tank received sparge transfers of water from tanks 241-SX-103 and 241-SX-115. From the first quarter of 1959 to the second quarter of 1963, supernatant waste was transferred to various 241-SX tanks. In the fourth quarter of 1959, flush water was sent from the tank to tank 241-SX-114.

In the second quarter of 1963, waste was transferred from the tank to the 202-S Plant for REDOX processing. From the second quarter of 1964 to the fourth quarter of 1975, flush water from miscellaneous sources was added to the tank. Some of this flush water consisted of Hanford Laboratory Operations and Battelle Pacific Northwest Laboratory waste. In the fourth quarter of 1971, waste was sent from the tank to tank 241-SX-111.

In support of the 242-S Evaporator campaign, supernatant waste was transferred to and received from tank 241-S-102 from the third quarter of 1972 to the fourth quarter of 1976. From the first quarter of 1972 to the second quarter of 1976, waste was transferred into and out of the tank into various tanks as feed staging for the 242-S Evaporator. From the second quarter of 1978 to the fourth quarter of 1980, waste was transferred to and received from tank 241-SY-102 in support of the 242-S Evaporator campaign. Waste was transferred into and received from various tanks from the first quarter of 1978 to the fourth quarter of 1979 as feed staging for the 242-S Evaporator. In the third and fourth quarters of 1980, a neutralized solution of HNO_3/$KMnO_4$ was added to the tank to neutralize the waste and increase volume reduction. The tank was removed from service and labeled inactive in 1980. Water from miscellaneous sources (most likely attributed to tank intrusions such as rain water) was added to the tank from 1983 to 1993. The tank was partially interim isolated in 1985.

Table A3-1. Tank 241-SX-106 Major Transfers.[1, 2, 3] (2 sheets)

Transfer Source	Transfer Destination	Waste Type	Time Period	Estimated Waste Volume	
				kL	kgal
Miscellaneous sources	--	Flush water	1954	57	15
241-SX-101, 241-SX-104, 241-SX-108, 241-SX-109, 241-SX-112, 241-SX-107, 241-SX-111, 241-SX-114, 241-SX-113, 241-SX-115, 241-SX-103, 241-SX-110	--	Condensate	1954 to 1963	53,579	14,154
Miscellaneous sources	--	Condensate	1959 to 1960	500	132
--	S-021 crib	Supernatant	1954 to 1971	44,418	11,734
Miscellaneous sources	--	Flush water	1956 to 1963	2,059	544
--	241-SX-104	Supernatant	1957	337	89
241-SX-103, 241-SX-115	--	Sparge water	1958 to 1960	814	215
--	241-SX-107, 241-SX-108, 241-SX-114, 241-SX-111, 241-SX-115, 241-SX-102, 241-SX-105	Supernatant	1959 to 1963	7,813	2,064
--	241-SX-114	Flush water	1959	76	20
--	202-S (REDOX)	Supernatant	1963	95	25
Miscellaneous sources	--	Flush water	1964 to 1975	3,717	982
--	241-SX-111	Supernatant	1971	644	170
--	241-S-102	Evaporator feed	1972 to 1976	49,562	13,093
241-S-102	--	Evaporator bottoms	1972 to 1976	24,590	6,496

Table A3-1. Tank 241-SX-106 Major Transfers.[1,2,3] (2 sheets)

Transfer Source	Transfer Destination	Waste Type	Time Period	Estimated Waste Volume	
				kL	kgal
241-SX-105, 241-BX-103, 241-C-103, 241-TX-107, 241-T-101, 241-B-102, 241-BX-106, 241-C-104	--	Evaporator feed	1972 to 1976	29,401	7,767
--	241-SX-114, 241-SX-102	Supernatant	1972 to 1974	2,324	614
--	241-SY-102	Evaporator feed	1978 to 1980	13,059	3,449
241-SY-102	--	Evaporator bottoms	1978 to 1980	9,127	2,411
--	241-SY-103, 241-SY-101, 241-S-102, 241-SX-101	Supernatant	1978 to 1979	6,079	1,606
241-U-111, 241-S-102, 241-U-107, 241-TX-118, 241-S-107	--	Evaporator feed	1978 to 1979	7,696	2,033
Miscellaneous sources	--	Neutralized waste ($HNO_3/KMnO_4$ solution)	1980	522	138
Miscellaneous sources	--	Flush water	1983 to 1993	231	61

Notes:

Waste volumes and types are best estimates based on historical data.

[1]Agnew et al. (1997b)

[2]Because only major transfers are listed, the sum of these transfers will not equal the current tank waste volume.

[3]Waste evaporated from tank is not included in this table.

A3.2 HISTORICAL ESTIMATION OF TANK CONTENTS

The historical transfer data used for this estimate are from the following sources.

- The *Waste Status and Transaction Record Summary (WSTRS) Rev. 4* (Agnew et al. 1997b) is a tank-by-tank quarterly summary spreadsheet of waste transactions.

- The *Hanford Tank Chemical and Radionuclide Inventories: HDW Model Rev. 4* (Agnew et al. 1997a) contains the HDW list, the SMM, the tank layer model (TLM), and the historical tank content estimate.

- The HDW list is comprised of approximately 50 waste types defined by concentration for major analytes/compounds for sludge and supernatant layers.

- The TLM defines the sludge and saltcake layers in each tank using waste composition and waste transfer information.

- The SMM is a subroutine within the HDW model that calculates the volume and composition of certain supernatant blends and concentrates.

Using these records, the TLM defines the sludge and saltcake layers in each tank. The SMM uses information from the waste status and transaction record summary, the TLM, and the HDW list to describe the supernatants and concentrates in each tank. Together the waste status and transaction record summary, TLM, SMM, and HDW list determine the inventory estimate for each tank. These model predictions are considered estimates that require further evaluation using analytical data.

Based on the TLM and SMM, tank 241-SX-106 contains four layers. A top layer of 231 kL (61 kgal) of supernatant is predicted to be above a layer of 1,477 kL (390 kgal) of SMMS2, over a layer of 326 kL (86 kgal) of SMMS1, over a bottom layer of 3.7 kL (1 kgal) of REDOX saltcake. Figure A3-1 is a graphical representation of the estimated waste type and volume for the tank layer.

The REDOX saltcake layer should contain the following major constituents listed from highest concentration above one weight percent: sodium, nitrate, nitrite, hydroxide, aluminum, and chromium. Constituents above one weight percent in the SMMS1 layer are nitrate, sodium, hydroxide, nitrite, aluminum, carbonate, and sulfate. Constituents above one weight percent in the SMMS2 layer are sodium, nitrate, hydroxide, nitrite, aluminum, sulfate, carbonate, phosphate, and TOC. Table A3-2 shows the historical estimate of the expected waste constituents and their concentrations.

Figure A3-1. Tank Layer Model.

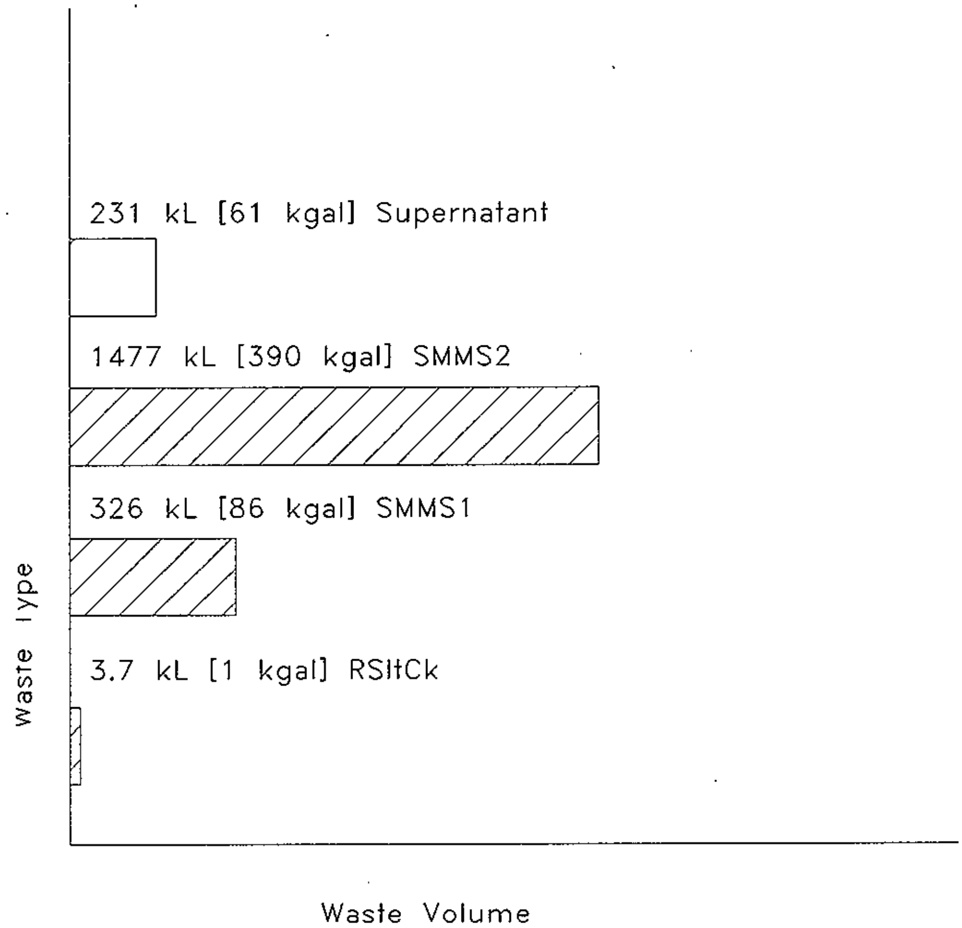


Table A3-2. Historical Tank Inventory Estimate.[1,2] (4 sheets)

Total Inventory Estimate					
Physical Properties				**-95 CI**	**+95 CI**
Total waste	3.27E+06 kg (538 kgal)			--	--
Heat load	4.31 kW (1.47E+04 Btu/hr)			4.05	4.58
Bulk density[3]	1.61 (g/cm^3)			1.56	1.65
Water wt%[3]	32.7			30.1	36.0
TOC wt% carbon (wet)[3]	0.749			0.490	1.01
Constituents	***M***	**ppm**	**kg[4]**	**-95 CI (*M*)**	**+95 CI (*M*)**
Na^+	14.2	2.03E+05	6.66E+05	13.0	15.2
Al^{3+}	1.67	2.81E+04	9.19E+04	1.55	1.79
Fe^{3+}	1.09E-02	379	1.24E+03	8.95E-03	1.29E-02
Cr^{3+}	0.149	4.83E+03	1.58E+04	0.125	0.157
Bi^{3+}	1.38E-03	179	586	1.25E-03	1.50E-03
La^{3+}	4.13E-05	3.57	11.7	2.99E-05	5.28E-05
Hg^{2+}	9.25E-06	1.15	3.78	8.59E-06	9.52E-06
Zr	2.60E-04	14.7	48.2	2.36E-04	2.82E-04
Pb^{2+}	1.01E-03	130	425	8.16E-04	1.20E-03
Ni^{2+}	6.52E-03	238	779	6.23E-03	6.66E-03
Sr^{2+}	0	0	0	0	0
Mn^{4+}	3.88E-03	133	435	2.94E-03	4.83E-03
Ca^{2+}	3.42E-02	852	2.79E+03	3.14E-02	3.70E-02
K^+	6.59E-02	1.60E+03	5.25E+03	6.02E-02	7.20E-02
OH^-	9.99	1.06E+05	3.46E+05	9.23	10.6
NO^{3-}	5.09	1.96E+05	6.42E+05	4.68	5.22
NO^{2-}	2.45	7.00E+04	2.29E+05	2.04	2.85
CO_3^{2-}	0.434	1.62E+04	5.31E+04	0.394	0.470
PO_4^{3-}	9.14E-02	5.40E+03	1.77E+04	7.82E-02	9.61E-02
SO_4^{2-}	0.245	1.46E+04	4.79E+04	0.193	0.297
Si	7.81E-02	1.36E+03	4.47E+03	6.46E-02	9.16E-02
F^-	6.76E-02	799	2.62E+03	5.66E-02	7.73E-02
Cl^-	0.246	5.41E+03	1.77E+04	0.223	0.265
$C_6H_5O_7^{3-}$	2.75E-02	3.24E+03	1.06E+04	2.53E-02	2.98E-02

Table A3-2. Historical Tank Inventory Estimate.[1, 2] (4 sheets)

Total Inventory Estimate					
Constituents (Cont'd)	*M*	ppm	kg[4]	-95 CI	+95 CI
$EDTA^{4-}$	1.48E-02	2.66E+03	8.70E+03	4.54E-03	2.53E-02
$HEDTA^{3-}$	2.77E-02	4.73E+03	1.55E+04	7.14E-03	4.87E-02
$Glycolate^{-}$	8.74E-02	4.08E+03	1.33E+04	5.72E-02	0.118
$Acetate^{-}$	6.20E-03	227	745	5.09E-03	7.31E-03
$Oxalate^{2-}$	5.41E-05	2.96	9.70	4.79E-05	6.03E-05
DBP	1.88E-02	2.45E+03	8.03E+03	1.54E-02	2.20E-02
Butanol	1.88E-02	865	2.83E+03	1.54E-02	2.20E-02
NH_3	8.69E-02	918	3.01E+03	7.17E-02	0.112
$Fe(CN)_6^{4-}$	0	0	0	0	0
Radiological Constituents	Ci/L	μCi/g	Ci[5]	-95 CI (Ci/L)	+95 CI (Ci/L)
^{3}H	2.52E-04	0.157	513	1.32E-04	2.70E-04
^{14}C	3.62E-05	2.25E-02	73.7	1.11E-05	3.73E-05
^{59}Ni	2.36E-06	1.47E-03	4.80	1.18E-06	2.47E-06
^{63}Ni	2.31E-04	0.144	470	1.14E-04	2.43E-04
^{60}Co	4.01E-05	2.49E-02	81.6	1.13E-05	4.16E-05
^{79}Se	3.61E-06	2.24E-03	7.35	2.00E-06	4.74E-06
^{90}Sr	0.120	74.8	2.45E+05	0.112	0.128
^{90}Y	0.120	74.8	2.45E+05	6.49E-02	0.128
^{93}Zr	1.77E-05	1.10E-02	36.1	9.69E-06	2.34E-05
^{93m}Nb	1.29E-05	8.00E-03	26.2	7.25E-06	1.68E-05
^{99}Tc	2.58E-04	0.160	525	1.64E-04	3.53E-04
^{106}Ru	7.13E-09	4.44E-06	1.45E-02	3.42E-09	8.72E-09
^{113m}Cd	9.27E-05	5.76E-02	189	4.46E-05	1.27E-04
^{125}Sb	1.72E-04	0.107	351	4.78E-05	1.79E-04
^{126}Sn	5.45E-06	3.39E-03	11.1	3.05E-06	7.16E-06
^{129}I	4.97E-07	3.09E-04	1.01	3.16E-07	6.81E-07
^{134}Cs	2.73E-06	1.70E-03	5.57	1.95E-06	3.53E-06
^{137}Cs	0.279	174	5.68E+05	0.251	0.307
^{137m}Ba	0.264	164	5.38E+05	0.207	0.291

Table A3-2. Historical Tank Inventory Estimate.[1,2] (4 sheets)

Total Inventory Estimate					
Radiological Constituents (Cont'd)	Ci/L	μCi/g	Ci[5]	-95 CI (Ci/L)	+95 CI (Ci/L)
^{151}Sm	1.27E-02	7.90	2.59E+04	7.09E-03	1.67E-02
^{152}Eu	4.17E-06	2.59E-03	8.49	2.18E-06	4.73E-06
^{154}Eu	6.51E-04	0.405	1.33E+03	2.50E-04	8.53E-04
^{155}Eu	2.46E-04	0.153	501	1.28E-04	2.81E-04
^{226}Ra	1.55E-10	9.62E-08	3.15E-04	1.05E-10	1.90E-10
^{228}Ra	1.51E-07	9.37E-05	0.307	6.31E-08	2.58E-07
^{227}Ac	9.78E-10	6.08E-07	1.99E-03	6.90E-10	1.18E-09
^{231}Pa	4.48E-09	2.79E-06	9.13E-03	2.88E-09	5.62E-09
^{229}Th	3.53E-09	2.20E-06	7.20E-03	1.61E-09	5.89E-09
^{232}Th	1.00E-08	6.24E-06	2.04E-02	5.19E-09	1.49E-08
^{232}U	7.75E-07	4.82E-04	1.58	4.24E-07	1.21E-06
^{233}U	2.97E-06	1.85E-03	6.05	1.63E-06	4.62E-06
^{234}U	8.70E-07	5.41E-04	1.77	8.38E-07	8.97E-07
^{235}U	3.53E-08	2.19E-05	7.19E-02	3.39E-08	3.64E-08
^{236}U	2.73E-08	1.70E-05	5.55E-02	2.63E-08	2.81E-08
^{238}U	1.01E-06	6.27E-04	2.05	9.75E-07	1.03E-06
^{237}Np	9.42E-07	5.86E-04	1.92	6.36E-07	1.25E-06
^{238}Pu	1.47E-06	9.16E-04	3.00	1.11E-06	1.83E-06
^{239}Pu	5.06E-05	3.15E-02	103	4.14E-05	5.98E-05
^{240}Pu	8.58E-06	5.34E-03	17.5	6.86E-06	1.03E-05
^{241}Pu	9.95E-05	6.19E-02	203	7.50E-05	1.24E-04
^{242}Pu	5.46E-10	3.40E-07	1.11E-03	4.00E-10	6.93E-10
^{241}Am	6.14E-05	3.82E-02	125	4.44E-05	7.85E-05
^{243}Am	2.13E-09	1.32E-06	4.34E-03	1.59E-09	2.69E-09
^{242}Cm	1.57E-07	9.78E-05	0.320	7.58E-08	1.79E-07
^{243}Cm	1.46E-08	9.06E-06	2.97E-02	6.79E-09	1.65E-08
^{244}Cm	1.44E-07	8.95E-05	0.293	6.38E-08	1.88E-07

Table A3-2. Historical Tank Inventory Estimate.[1,2] (4 sheets)

Total Inventory Estimate					
Totals	*M*	μg/g	kg	-95 CI (*M* or g/L)	+95 CI (*M* or g/L)
Pu	6.35E-04 (g/L)	----	1.29	4.61E-04	8.08E-04
U	9.96E-03	1.47E+03	4.83E+03	9.55E-03	1.03E-02

Notes:

CI = confidence interval

[1]Agnew et al. (1997a)

[2]These predictions have not been validated and should be used with caution.

[3]This is the volume average for density, mass average water wt% and TOC wt% carbon.

[4]Differences exist among the inventories in this column and the inventories calculated from the two sets of concentrations.

[5]Unknowns in tank solids inventory are assigned by the TLM.

A4.0 SURVEILLANCE DATA

Tank 241-SX-106 surveillance consists of surface-level measurements (liquid and solid), temperature monitoring inside the tank (waste and headspace), dry-well monitoring, and a SHMS. Surveillance data provide the basis for determining tank integrity.

Liquid-level measurements and dry-well measurements can indicate whether the tank has a major leak. Solid surface-level measurements can indicate physical changes in and consistencies of the solid layers of a tank. The SHMS primarily monitors hydrogen gas concentration in the tank headspace.

A4.1 SURFACE-LEVEL READINGS

Tank 241-SX-106 is categorized as a sound tank. Before August 1994 a Food Instrument Corporation gauge or manual tape was used to measure surface level. The Food Instrument Corporation gauge has been replaced by an ENRAF™ gauge that is used to monitor the surface level through riser 3. On May 31, 1998, the waste surface level was 503 cm (198 in.) as measured by the manual and automatic ENRAF™ gauges. Figure A4-1 is a level history graph of the volume measurements.

A4.2 DRY-WELL READINGS

Tank 241-SX-106 has four dry wells. None of the dry wells has radiation readings greater than 200 counts per second.

A4.3 INTERNAL TANK TEMPERATURES

Tank 241-SX-106 has a single thermocouple tree with six thermocouples to monitor the waste temperature through riser 16. Temperature readings are available from the Surveillance Analysis Computer System from February 1988 to May 1998 (LMHC 1998). Thermocouple elevations and current temperature data are recorded for thermocouples 1 through 6.

The average temperature between May 31, 1997, and May 31, 1998, was 37.9 °C (100.2 °F), the minimum temperature was 28.3 °C (82.9 °F), and the maximum temperature was 42.1 °C (107.8 °F). A graph of the weekly high temperatures can be found in Figure A4-2. Plots of the individual thermocouple readings can be found in the *Supporting Document for the Historical Tank Content Estimate for SX-Tank Farm* (Brevick et al. 1997).

A4.4 STANDARD HYDROGEN MONITORING SYSTEM

Wilkins et al. (1997) describes the SHMS type B that monitors the vapor phase in the tank 241-SX-106 headspace. The SHMS measures parts-per-million levels of hydrogen, methane, and nitrous oxide. The tank 241-SX-106 SHMS went into service in March 1995. Section B2.3.1 presents the surveillance results from the SHMS.

A4.5 TANK 241-SX-106 PHOTOGRAPHS

The June 1989 photographic montage of the interior of tank 241-SX-106 shows a light-colored, thin, saltcake surface with dark liquid underneath. Various pieces of equipment are visible. The waste level has not changed significantly since the photographs were taken; therefore, the photographic montage should represent the current appearance of the waste in the tank (Brevick et al. 1997).

Figure A4-1. Tank 241-SX-106 Level History.

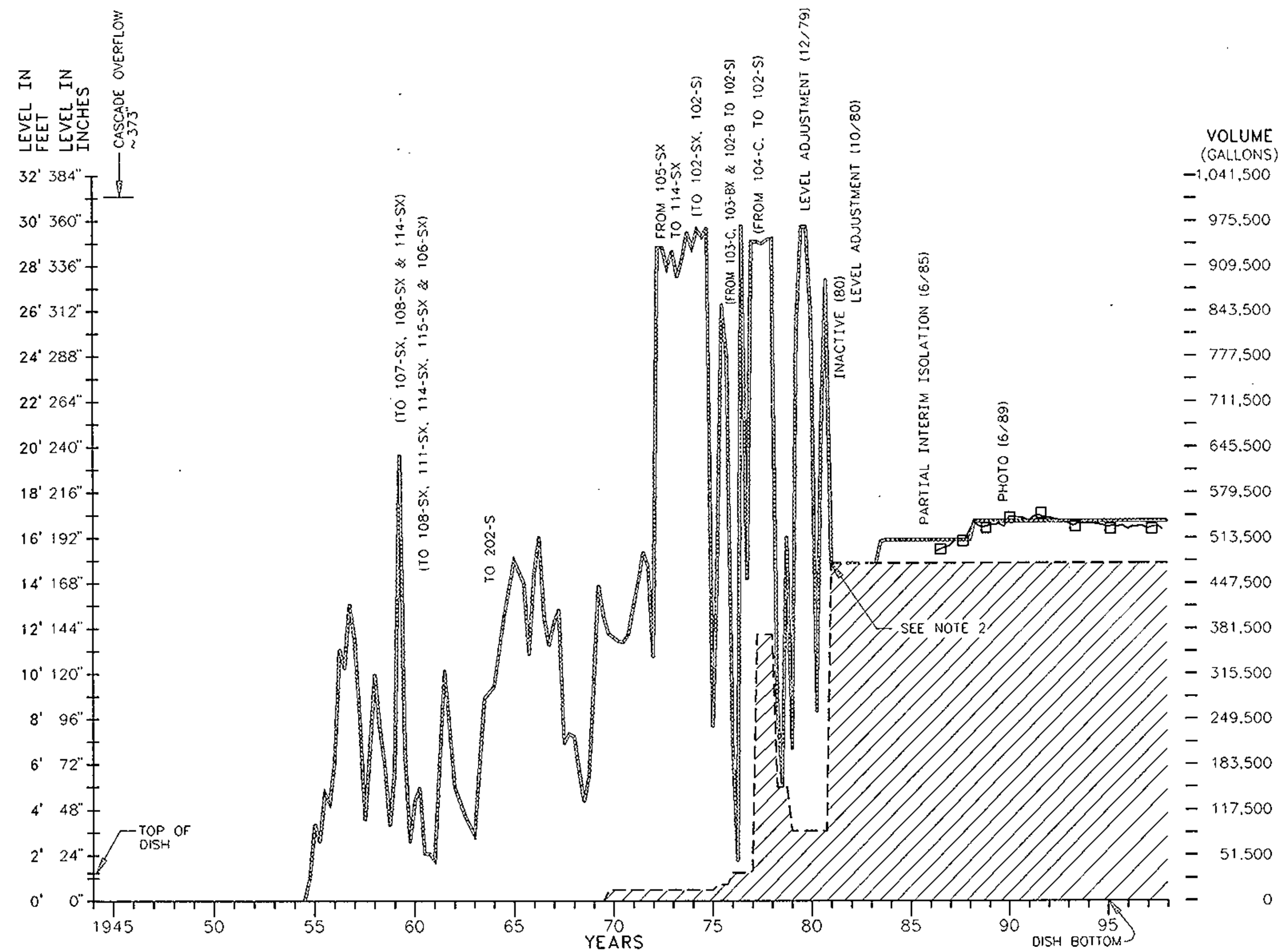
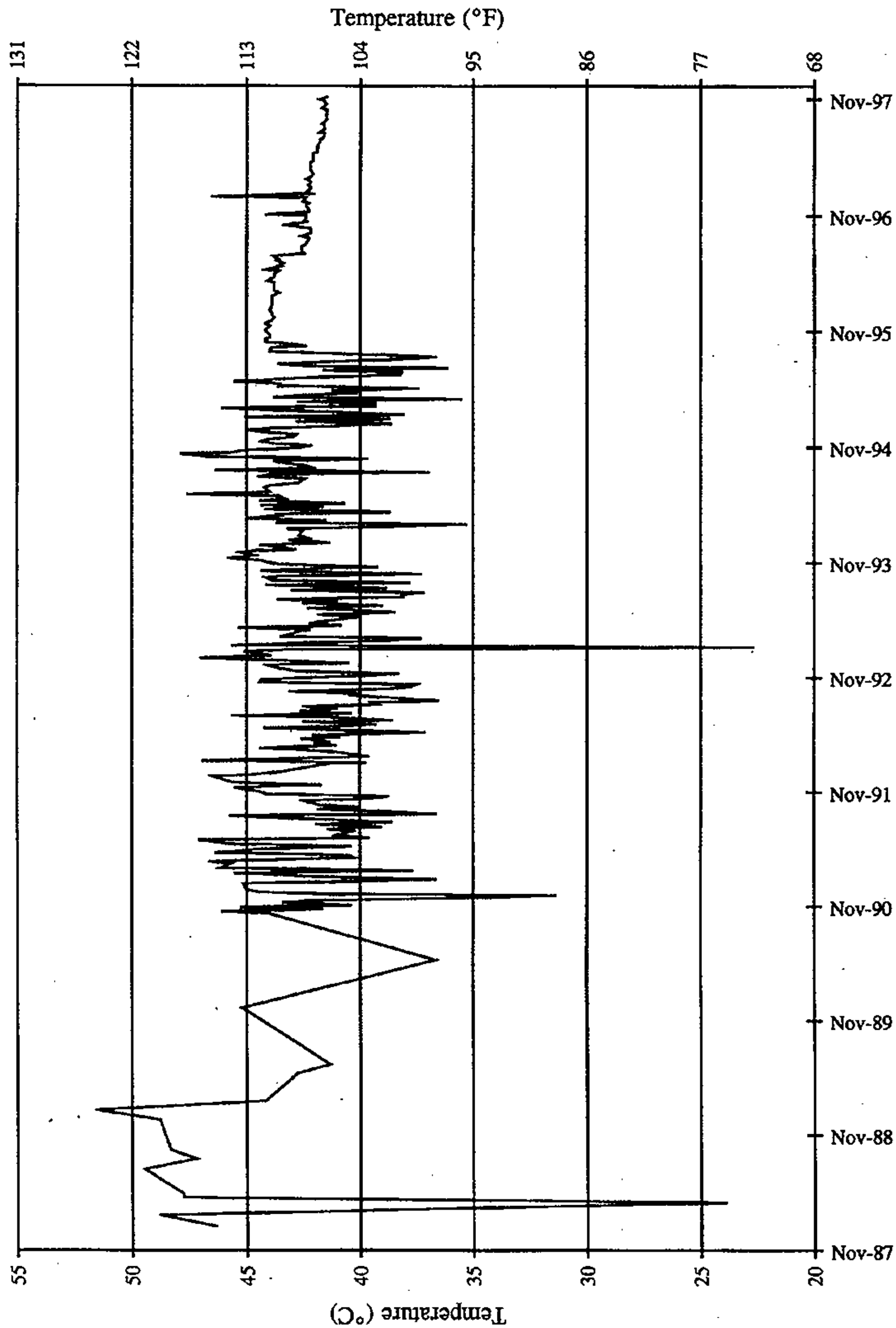


Figure A4-2. Tank 241-SX-106 High Temperature Plot.



A5.0 APPENDIX A REFERENCES

Agnew, S. F., J. Boyer, R. A. Corbin, T. B. Duran, J. R. Fitzpatrick, K. A. Jurgensen, T. P. Ortiz, and B. L. Young, 1997b, *Hanford Tank Chemical and Radionuclide Inventories: HDW Model Rev. 4*, LA-UR-96-3860, Los Alamos National Laboratory, Los Alamos, New Mexico.

Agnew, S. F., R. A. Corbin, T. B. Duran, K. A. Jurgensen, T. P. Ortiz, and B. L. Young, 1997b, *Waste Status and Transaction Record Summary (WSTRS) Rev. 4*, LA-UR-97-311, Los Alamos National Laboratory, Los Alamos, New Mexico.

Alstad, A. T., 1993, *Riser Configuration Document for Single-Shell Waste Tanks*, WHC-SD-RE-TI-053, Rev. 9, Westinghouse Hanford Company, Richland, Washington.

Brevick, C. H., J. L. Stroup, and J. W. Funk, 1997, *Supporting Document for the Historical Tank Content Estimate for SX-Tank Farm*, WHC-SD-WM-ER-324, Rev. 1, Fluor Daniel Northwest, Inc., for Fluor Daniel Hanford, Inc., Richland, Washington.

Hanlon, B. M., 1998, *Waste Tank Summary Report for Month Ending May 31, 1998*, HNF-EP-0182-122, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

Leach, C. E. and S. M. Stahl, 1997, *Hanford Site Tank Farm Facilities Interim Safety Basis*, WHC-SD-WM-ISB-001, Rev. 0M, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

Lipnicki, J., 1997, *Waste Tank Risers Available for Sampling*, HNF-SD-WM-TI-710, Rev. 4, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

LMHC, 1998, SACS: Surveillance Analysis Computer System. In: SQLServer/Visual Basic, [Mainframe], Available: Hanford Local Area Network, Lockheed Martin Hanford Corp.Richland, Washington.

Public Law 101-510, 1990, "Safety Measures for Waste Tanks at Hanford Nuclear Reservation," Section 3137 of *National Defense Authorization Act for Fiscal Year 1991*.

Tran, T. T., 1993, *Thermocouple Status Single-Shell & Double-Shell Waste Tanks*, WHC-SD-WM-TI-553, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Vitro, 1985, *Piping Waste Tank Isolation 241-SX-106*, H-2-73223, Rev. 2, Vitro Engineering Corporation, Richland, Washington.

Wilkins, N. E., R. E. Bauer, and D. M. Ogden, 1997, *Results of Vapor Space Monitoring of Flammable Gas Watch List Tanks*, HNF-SD-WM-TI-797, Rev. 2, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

This page intentionally left blank.

APPENDIX B

SAMPLING OF TANK 241-SX-106

This page intentionally left blank.

APPENDIX B

SAMPLING OF TANK 241-SX-106

Appendix B provides sampling and analysis information for each known sampling event for tank 241-SX-106 and assesses the push mode core sample results. It includes the following:

- **Section B1.0**: Tank Sampling Overview
- **Section B2.0**: Sampling Events
- **Section B3.0**: Assessment of Characterization Results
- **Section B4.0**: References for Appendix B.

B1.0 TANK SAMPLING OVERVIEW

Appendix B describes the sampling and analysis events for tank 241-SX-106. Push mode core samples were taken in October and December 1997 to satisfy the requirements of the *Tank Safety Screening Data Quality Objective* (Dukelow et al. 1995), *Memorandum of Understanding for the Organic Complexant Safety Issue Data Requirements* (Schreiber 1997), *Data Quality Objective to Support Resolution of the Organic Solvent Safety Issue* (Meacham et al. 1997), and *Data Quality Objective to Support Resolution of the Flammable Gas Safety Issue* (Bauer and Jackson 1998). The sampling and analyses were performed in accordance with the *Tank 241-SX-106 Push Mode Core Sampling and Analysis Plan* (Jo 1997). Further discussions of the sampling and analysis procedures can be found in the *Tank Characterization Reference Guide* (DeLorenzo et al. 1994). These analyses are discussed in Section B2.1.

The tank sampling and analysis plan also includes requirements to support the *Sampling Plan for Tank 241-SX-106 Retained Gas Sampler Deployment* (Bates 1997). These analyses are discussed in Section B2.2.

Tank headspace vapors were characterized from samples collected in March 1995 in accordance with the *Tank 241-SX-106 Tank Characterization Plan* (Homi 1995). These analyses are discussed in Section B2.3.

B2.0 SAMPLING EVENTS

This section describes sampling events. The analytical results used to characterize current tank contents were derived from the 1995 vapor sample and 1997 push mode core sample. The analytical results from the 1997 core sample are shown in this section. The sampling and analytical requirements from the safety screening, flammable gas, organic complexant, and organic solvent DQOs are also summarized.

B2.1 1997 CORE SAMPLING EVENT

A vertical profile of the waste is used to satisfy the requirements of the safety screening DQO (Dukelow et al. 1995). Safety screening analyses include total alpha activity to determine criticality, DSC to ascertain the fuel energy value, and thermogravimetric analysis (TGA) to obtain the total moisture content. In addition, combustible gas meter readings in the tank headspace were performed to measure flammability. The safety screening DQO also requires bulk density measurements.

In accordance with Jo (1997), two core samples were to be obtained from tank 241-SX-106 risers 3 and 6 with 11 segments expected in each core. Cores 223 and 224 were obtained from risers 6 and 3, respectively.

Core 223 consisted of 10 push mode core segments removed from tank 241-SX-106, riser 6, between October 13 and October 30, 1997. Segments were received by the 222-S Laboratory between October 15 and November 7, 1997. Selected segments (6, 6A, and 9) were sampled using the RGS and extruded by the Chemistry, Analysis and Technical Support Group. Segment 11 was also sampled using the RGS; however, during retrieval the grapple cable broke, requiring the drill string and sampler to be removed manually. The x-rays of the sampler indicated that it contained lithium bromide solution and air with no sample material present.

Core 224 consisted of eleven push mode core segments removed from tank 241-SX-106, riser 3, between December 2 and December 11, 1997. Segments were received by the 222-S Laboratory between December 3 and December 12, 1997. Selected segments (2, 4, 7, and 10) were sampled using the RGS and extruded by the Chemistry, Analysis and Technical Support Group.

A field blank was provided to the 222-S Laboratory with core 223. It underwent the same analysis as the drainable liquid as instructed by Jo (1997).

Lithium bromide-traced water was used to maintain back pressure on the drill string during sampling. Each sample segment underwent ICP analysis for lithium and ion chromatography (IC) analysis for bromide to determine how much, if any, external water may have entered the sample during sampling.

Table B2-1 summarizes the sampling and analytical requirements from the safety screening, flammable gas, organic complexant, and organic solvent DQOs.

Table B2-1. Integrated Data Quality Objective Requirements for Tank 241-SX-106.[1]

Sampling Event	Applicable DQOs	Sampling Requirements	Analytical Requirements
Push mode core sampling	Safety screening - Energetics - Moisture content - Total alpha - Flammable gas Dukelow et al. (1995) Flammable gas Bauer and Jackson (1998) Organic complexant Schreiber (1997)	Core samples from a minimum of two risers separated radially to the maximum extent possible. Combustible gas measurement	Flammability, energetics, moisture, total alpha activity, density, anions, cations, radionuclides, TOC, separable organics, physical properties, TIC
Vapor sampling	Organic solvent Meacham et al. (1997)	Steel canisters, triple sorbent traps, sorbent trap systems	Flammable gas, organic vapors, permanent gases

Note:

[1]Jo (1997)

B2.1.1 Sample Handling

The core samples were shipped to the 222-S Laboratory for subsampling and analysis. Samples were assigned laboratory numbers and were subjected to visual inspection for color, clarity, and solids content. The radiation dose rate on contact was also measured. Drainable liquid was collected and clarified by centrifugation. Segments containing solids were divided into upper and lower half segments and were also divided longitudinally to provide material for the gas bubble retention and release studies.

The SAP (Jo 1997) states that the core samples should be transported to the laboratory within three calendar days from the time each segment is removed from the tank. This was not met for some segments from cores 223 and 224.

Sample extrusion and subsampling for the two cores are presented in Table B2-2.

Table B2-2. Tank 241-SX-106 Subsampling Scheme and Sample Description.[1] (4 sheets)

Sample Identification	Core: Segment	Weight (g)	Solid/Liquid Recovered (g)	Sample Description
Core 223, Riser 6				
223-01	223:1	329.2	Drainable liquid	250 mL of drainable liquid, which was pale yellow and opaque, were collected. 3 in. of pale yellow solids with the texture of a wet salt were extruded. No organic layer was observed.
		39.4	Lower half	
223-02	223:2	325.1	Drainable liquid	250 mL of drainable liquid, which was pale yellow and opaque, were collected. 3 in. of pale yellow solids with the texture of a wet salt were extruded. No organic layer was observed.
		57.0	Lower half	
223-03	223:3	353.9	Drainable liquid	250 mL of drainable liquid, which was pale yellow and opaque, were collected. 4 in. of pale yellow solids with the texture of a wet salt were extruded. No organic layer was observed.
		71.7	Lower half	
223-04	223:4	379.9	Drainable liquid	270 mL of drainable liquid, which was gray-green and opaque, was collected. 1.5 in. of gray solids with the texture of a salt slurry were extruded. No organic layer was observed.
		32.2	Lower half	
223-05	223:5	363.0	Drainable liquid	250 mL of drainable liquid, which was greenish brown and opaque, were collected. 1 in. of gray solids with the texture of a wet salt was extruded. No organic layer was observed.
		44.9	Lower half	
223-06	223:6	N/A	N/A	This segment was sampled using an RGS. Extrusion information is not included in this report.

Table B2-2. Tank 241-SX-106 Subsampling Scheme and Sample Description.[1] (4 sheets)

Sample Identification	Core: Segment	Weight (g)	Solid/Liquid Recovered (g)	Sample Description
Core 223, Riser 6 (Cont'd)				
223-06A	223:6A	N/A	N/A	This segment was sampled using an RGS. Extrusion information is not included in this report.
223-07	223:7	214.9	Upper half	There was no drainable liquid. 14 in. of black solids with the texture of a wet sludge were extruded. Solids were subsampled in half segments.
		179.4	Lower half	
223-08	223:8	96.8	Upper half	There was no drainable liquid. 10 in. of solids were extruded. The upper 2 in. were black with the texture of a wet sludge. The lower 8 in. were dark grey with the texture of a salt slurry. Solids were subsampled in half segments.
		245.3	Lower half	
223-09	223:9	N/A	N/A	This segment was sampled using an RGS. Extrusion information is not included in this report. X-rays show 12.25 in. of sample.
223-10	223:10	235.1	Upper half	There was no drainable liquid. 11.5 in. of dark brown solids were extruded. The upper 9 in. had the texture of a moist salt. The lower 2.5 in. had the texture of a salt slurry. Solids were subsampled in half segments.
		57.4	Lower half	
Core 224, Riser 3				
224-01	224:1	356.0	Drainable liquid	250 mL of drainable liquid, which was pale yellow and opaque, were collected. 3 in. of white solids with the texture of a salt slurry were extruded. No organic layer was observed.
		44.7	Lower half	
224-02	224:2	N/A	N/A	This segment was sampled using an RGS. Extrusion information is not included in this report. X-rays show 19 in. of sample.

Table B2-2. Tank 241-SX-106 Subsampling Scheme and Sample Description.[1] (4 sheets)

Sample Identification	Core: Segment	Weight (g)	Solid/Liquid Recovered (g)	Sample Description
Core 224, Riser 3 (Cont'd)				
224-03	224:3	365.6	Drainable liquid	250 mL of drainable liquid, which was pale yellow and opaque, was collected. 2 in. of white solids with the texture of a wet salt were extruded. No organic layer was observed.
		35.4	Lower half	
224-04	224:4	N/A	N/A	This segment was sampled using an RGS. Extrusion information is not included in this report.
224-05	224:5	136.1	Drainable liquid	110 mL of drainable liquid, which was dark grey and opaque, were collected. 14 in. of solids were extruded. The upper 2 in. were white with the texture of a salt slurry. The lower 12 in. were dark brown with the texture of a salt/sludge slurry. No organic layer was observed.
		12.1	Upper half	
		262.6	Lower half	
224-06	224:6	79.3	Drainable liquid	55 mL of drainable liquid, which was dark grey and opaque. were collected. 16 in. of dark brown solids with the texture of a salt/sludge slurry were extruded. No organic layer was observed.
		167.2	Upper half	
		158.9	Lower half	
224-07	224:7	N/A	N/A	This segment was sampled using an RGS. Extrusion information is not included in this report. X-rays show 13.5 in. of sample.
224-08	224:8	70.4	Upper half	There was no drainable liquid. 13 in. of dark grey solids with the texture of a wet salt were extruded. Solids were subsampled in half segments.
		245.2	Lower half	

Table B2-2. Tank 241-SX-106 Subsampling Scheme and Sample Description.[1] (4 sheets)

Sample Identification	Core: Segment	Weight (g)	Solid/Liquid Recovered (g)	Sample Description
Core 224, Riser 3 (Cont'd)				
224-09	224:9	129.7	Upper half	There was no drainable liquid. 14.5 in. of dark grey solids were extruded. The upper 6 in. had the texture of a wet salt. The lower 8.5 in. had the texture of a dry salt. Solids were subsampled in half segments.
		156.5	Lower half	
224-10	224:10	N/A	N/A	This segment was sampled using an RGS. Extrusion information is not included in this report. X-rays show 13.5 in. of sample.
224-11	224:11	305.4	Upper half	There was no drainable liquid. 16 in. of dark grey solids with the texture of a wet salt were extruded. Solids were subsampled in half segments.
		121.8	Lower half	

Notes:

N/A = This information was not available

[1]Steen (1998)

B2.1.2 Sample Analysis

The analyses performed on the segment core samples were those required by the safety screening, organic complexant, and flammable gas DQOs. The analyses required by the safety screening DQO included analyses for thermal properties by DSC, moisture content by TGA, content of fissile material by total alpha activity analysis, and bulk density. The safety screening DQO required ICP and IC analyses for lithium and bromide to assess the potential for hydrostatic head fluid contamination. The organic complexant DQO required analyses for TOC, thermal properties by DSC, and moisture content by TGA.

There was insufficient sample material from the core 224, segment 6, drainable liquid to perform the requested analyses.

All reported analyses were performed according to approved laboratory procedures (see Table B2-3). Table B2-4 is a summary of the sample portions, sample numbers, and analyses performed on each core sample.

Table B2-3. Analytical Procedures.[1]

Analysis	Method	Procedure Number
Energetics	Differential scanning calorimetry	LA-514-114
Percent water	Thermogravimetric analysis	LA-514-114
Bulk density	Gravimetry	LA-519-132
Specific gravity	Gravimetry	LA-510-112
Anions by IC	Ion chromatography	LA-533-105
ICP/AES analytes	Inductively coupled plasma spectrophotometry	LA-505-161
TIC/TOC	Persulfate oxidation/coulometry	LA-342-100
TOC	Furnace oxidation/coulometry	LA-344-105
Total alpha activity	Alpha proportional counter	LA-508-101
Flammable gas	Combustible gas analysis	IH 1.4 and IH 2.1[2]

Notes:

AES = atomic emission spectroscopy

[1]Steen (1998)
[2]WHC (1992)

Table B2-4. Tank 241-SX-106 Sample Analysis Summary.[1] (6 sheets)

Riser	Sample Identification	Sample Portion	Sample Number	Analyses
6	Core 223, segment 1	Drainable liquid	S97T002179	TIC/TOC, specific gravity, ICP, IC, DSC/TGA, alpha
		Lower half	S97T002175	Bulk density
			S97T002176	TIC/TOC, DSC/TGA
			S97T002177	ICP, alpha
			S97T002178	IC
	Core 223, segment 2	Drainable liquid	S97T002188	TIC/TOC, specific gravity, ICP, IC, DSC/TGA, alpha
		Lower half	S97T002182	Bulk density
			S97T002183	TIC/TOC, DSC/TGA
			S97T002185	ICP, alpha
			S97T002186	IC

Table B2-4. Tank 241-SX-106 Sample Analysis Summary.[1] (6 sheets)

Riser	Sample Identification	Sample Portion	Sample Number	Analyses
6 (Cont'd)	Core 223, segment 3	Drainable liquid	S97T002199	TIC/TOC, specific gravity, ICP, IC, DSC/TGA, alpha
		Lower half	S97T002190	Bulk density
			S97T002191	TIC/TOC, DSC/TGA
			S97T002194	ICP, alpha
			S97T002196	IC
	Core 223, segment 4	Drainable liquid	S97T002200	TIC/TOC, specific gravity, ICP, IC, DSC/TGA, alpha
		Lower half	S97T002192	TIC/TOC, DSC/TGA
			S97T002193	Bulk density
			S97T002204	ICP, alpha
			S97T002205	IC
	Core 223, segment 5	Drainable liquid	S97T002215	TIC/TOC, specific gravity, ICP, IC, DSC/TGA, alpha
		Lower half	S97T002217	Bulk density
			S97T002218	TIC/TOC, DSC/TGA
			S97T002231	ICP, alpha
			S97T002237	IC
	Core 223, segment 6	Whole	S97T002236	Bulk density
			S98T000692	TIC/TOC, DSC/TGA
			S98T000694	ICP, alpha
			S98T000695	ICP
			S98T000696	IC
	Core 223, segment 6A	Whole	S97T002242	Bulk density
			S98T000697	TIC/TOC, DSC/TGA
			S98T000703	ICP, alpha
			S98T000705	ICP
			S98T000707	IC

Table B2-4. Tank 241-SX-106 Sample Analysis Summary.[1] (6 sheets)

Riser	Sample Identification	Sample Portion	Sample Number	Analyses
6 (Cont'd)	Core 223, segment 7	Upper half	S97T002220	TIC/TOC, DSC/TGA
			S97T002233	ICP
			S97T002239	IC
		Lower half	S97T002225	Bulk density
			S97T002226	TIC/TOC, DSC/TGA
			S97T002232	ICP, alpha
			S97T002238	IC
	Core 223, segment 8	Upper half	S97T002223	TIC/TOC, DSC/TGA
			S97T002235	ICP
			S97T002241	IC
		Lower half	S97T002228	Bulk density
			S97T002229	TIC/TOC, DSC/TGA
			S97T002234	ICP, alpha
			S97T002240	IC
	Core 223, segment 9	Whole	S97T002251	Bulk density
			S98T000698	TIC/TOC, DSC/TGA
			S98T000704	ICP, alpha
			S98T000706	ICP
			S98T000708	IC
	Core 223, segment 10	Upper half	S97T002262	TIC/TOC, DSC/TGA
			S97T002265	ICP
			S97T002266	IC
		Lower half	S97T002258	Bulk density
			S97T002259	TIC/TOC, DSC/TGA
			S97T002263	ICP, alpha
			S97T002264	IC

Table B2-4. Tank 241-SX-106 Sample Analysis Summary.[1] (6 sheets)

Riser	Sample Identification	Sample Portion	Sample Number	Analyses
3	Core 224, segment 1	Drainable liquid	S97T002323	TIC/TOC, specific gravity, ICP, IC, DSC/TGA
		Lower half	S97T002317	Bulk density
			S97T002318	TIC/TOC, DSC/TGA
			S97T002320	ICP, alpha
			S97T002321	IC
	Core 224, segment 2	Whole	S97T002310	Bulk density
			S98T000709	TIC/TOC, DSC/TGA
			S98T000717	ICP, alpha
			S98T000721	ICP
			S98T000725	IC
	Core 224, segment 3	Drainable liquid	S97T002371	TIC/TOC, specific gravity, ICP, IC, DSC/TGA
		Lower half	S97T002331	Bulk density
			S97T002333	TIC/TOC, DSC/TGA
			S97T002334	ICP, alpha
			S97T002335	IC
	Core 224, segment 4	Whole	S97T002327	Bulk density
			S98T000710	TIC/TOC, DSC/TGA
			S98T000718	ICP, alpha
			S98T000722	ICP
			S98T000726	IC

Table B2-4. Tank 241-SX-106 Sample Analysis Summary.[1] (6 sheets)

Riser	Sample Identification	Sample Portion	Sample Number	Analyses
3 (Cont'd)	Core 224, segment 5	Drainable liquid	S97T002372	TIC/TOC, specific gravity, ICP, IC, DSC/TGA
		Upper half	S97T002348	TIC/TOC, DSC/TGA
			S97T002354	IC
			S97T002360	ICP
		Lower half	S97T002336	Bulk density
			S97T002347	TIC/TOC, DSC/TGA
			S97T002353	IC
			S97T002359	ICP, alpha
	Core 224, segment 6	Upper half	S97T002350	TIC/TOC, DSC/TGA
			S97T002356	IC
			S97T002362	ICP
		Lower half	S97T002338	Bulk density
			S97T002349	TIC/TOC, DSC/TGA
			S97T002355	IC
			S97T002361	ICP, alpha
	Core 224, segment 7	Whole	S97T002374	Bulk density
			S98T000711	TIC/TOC, DSC/TGA
			S98T000719	ICP, alpha
			S98T000723	ICP
			S98T000727	IC
	Core 224, segment 8	Upper half	S97T002352	TIC/TOC, DSC/TGA
			S97T002358	IC
			S97T002364	ICP
		Lower half	S97T002340	Bulk density
			S97T002351	TIC/TOC, DSC/TGA
			S97T002357	IC
			S97T002363	ICP, alpha

Table B2-4. Tank 241-SX-106 Sample Analysis Summary.[1] (6 sheets)

Riser	Sample Identification	Sample Portion	Sample Number	Analyses
3 (Cont'd)	Core 224, segment 9	Upper half	S97T002390	TIC/TOC, DSC/TGA
			S97T002392	ICP
			S97T002393	IC
		Lower half	S97T002384	Bulk density
			S97T002385	TIC/TOC, DSC/TGA
			S97T002387	ICP, alpha
			S97T002388	IC
	Core 224, segment 10	Whole	S97T002376	Bulk density
			S98T000712	TIC/TOC, DSC/TGA
			S98T000720	ICP, alpha
			S98T000724	ICP
			S98T000728	IC
	Core 224, segment 11	Upper Sample	S97T002400	TIC/TOC, DSC/TGA
			S97T002402	ICP
			S97T002403	IC, TOC
		Lower half	S97T002394	Bulk density
			S97T002395	TIC/TOC, DSC/TGA
			S97T002397	ICP, alpha
			S97T002398	IC

Note:

[1]Steen (1998)

B2.1.3 Analytical Results

This section summarizes the sampling and analytical results associated with the October through December 1997 sampling and analysis of tank 241-SX-106. Table B2-5 indicates which summary result tables are associated with the total alpha activity, percent water, energetics, IC, ICP, and TOC analytical results. These results are documented in Steen (1998).

Table B2-5. Analytical Tables.

Analysis	Table Number
ICP/emission spectroscopy	B2-9 through B2-45
IC	B2-46 through B2-53
TIC	B2-54
TOC by persulfate	B2-55
TOC by furnace oxidation	B2-56
Total alpha	B2-57
Energetics by DSC	B2-58 and B2-59
Percent water by TGA	B2-60
Bulk density	B2-61
Specific gravity	B2-62

The quality control parameters assessed in conjunction with tank 241-SX-106 samples were standard recoveries, spike recoveries, duplicate analyses (relative percent differences [RPDs]), and blanks. The quality control criteria are specified in the SAP (Jo 1997). The limits for blanks are set forth in guidelines followed by the laboratory, and all data results in this report have met those guidelines. Sample and duplicate pairs, in which any quality control parameter was outside these limits, are footnoted in the sample mean column of the following data summary tables with an a, b, c, d, e, f, g, and h as follows:

- "a" indicates the standard recovery was below the quality control limit
- "b" indicates the standard recovery was above the quality control limit
- "c" indicates the spike recovery was below the quality control limit
- "d" indicates the spike recovery was above the quality control limit
- "e" indicates the RPD was greater than the quality control limit range
- "f" indicates that there was blank contamination
- "g" indicates that this is a tentatively identified compound
- "h" indicates that the serial dilution exceeds the acceptance limit.

In the analytical tables in this section, the "mean" is the average of the result and duplicate value. All values, including those below the detection level (denoted by "<") were averaged. If both sample and duplicate values were nondetected or if one value was detected while the other was not, the mean is expressed as a nondetected value. If both values were detected, the mean is expressed as a detected value.

B2.1.3.1 Inductively Coupled Plasma. Analyses by ICP were performed in duplicate on all samples. The analyses were performed directly on the drainable liquid samples following an acid dilution. The solid samples were analyzed following a potassium hydroxide fusion digestion in a nickel crucible. In addition, the solid subsamples from the RGS segments were prepared for analysis by acid digestion. Although a full suite of analytes were reported, only lithium was specifically requested by the safety screening DQO to correct potentially compromised percent water measurements.

The primary ICP analytes detected were aluminum, iron, sodium, and zirconium. Lithium values were below detection levels. This suggests that hydrostatic head fluid contamination was not a problem.

B2.1.3.2 Ion Chromatography (Ions). The analyses for IC were performed in duplicate on all samples. The analyses were performed directly on the drainable liquid samples. The solid samples were analyzed following a water digestion. Although a full suite of analytes were reported, only bromide was specifically requested by the safety screening DQO to correct potentially compromised percent water measurements.

The primary IC analytes detected were nitrate, nitrite, and phosphate. With the exception of a few segments, the majority of the bromide values were below detection levels.

B2.1.3.3 Total Inorganic Carbon. The analyses for TIC by persulfate/coulometry were performed in duplicate directly on all samples. The solid mean results ranged from 1,530 μg C/g to 10,200 μg C/g. The liquid mean results ranged from 4,760 μg C/mL to 5,500 μg C/mL.

B2.1.3.4 Total Organic Carbon. The analyses for TOC by persulfate/coulometry were performed in duplicate directly on all samples. None of the results exceeded the TOC notification limit of 3 weight percent (dry weight). The solid mean results ranged from 1,230 μg C/g to 6,410 μg C/g. The liquid mean results ranged from 3,850 μg C/mL to 4,500 μg C/mL.

The analyses for TOC by furnace oxidation/coulometry were required as a secondary analysis for those samples that exhibited exothermic energy, and the persulfate TOC did not account for 75 percent of the exothermic energy. The core 224, segment 11, upper half, solid sample was analyzed following a water digestion. The results did not exceed the TOC notification limit of 3 wt weight percent (dry weight).

B2.1.3.5 Total Alpha Activity. Analyses for total alpha activity were performed in duplicate directly on the drainable liquids. The centrifuged solid samples were analyzed in duplicate following a fusion digestion. All liquid total alpha results were below the total alpha activity action limit of 61.5 μCi/mL. All solid total alpha results were below the total alpha activity action limit of 34.4 μCi/g. The highest results returned were 0.0038 μCi/mL for the liquid samples and 1.26 μCi/g for the solid samples.

B2.1.3.6 Differential Scanning Calorimetry. In a DSC analysis, heat absorbed or emitted by a substance is measured while the sample is heated at a constant rate. Nitrogen is passed over the sample material to remove any gases being released. The onset temperature for an endothermic or exothermic event is determined graphically. The analyses for exothermic energy by DSC were performed in duplicate directly on the samples.

All DSC results were below the action limit of 480 J/g dry weight. The highest result returned was 269 J/g dry weight (core 224, segment 11, upper half).

B2.1.3.7 Thermogravimetric Analysis. Thermogravimetric analysis measures the mass of a sample as its temperature is increased at a constant rate. Nitrogen is passed over the sample during heating to remove any released gases. Any decrease in the weight of a sample during TGA represents a loss of gaseous matter from the sample, through evaporation or through a reaction that forms gas phase products. The moisture content is estimated by assuming that all TGA sample weight loss up to a certain temperature (typically 150 to 200 °C [300 to 390 °F]) is caused by water evaporation. The temperature limit for moisture loss is chosen by the operator at an inflection point on the TGA plot. Other volatile matter fractions can often be differentiated by inflection points as well.

The analyses for moisture content by TGA were performed in duplicate directly on all samples. TGA results were determined by summing the weight loss steps that occurred below 250°C (482 °F); weight loss steps above this temperature were not used to determine the result. The percent water for tank 241-SX-106 samples ranged from 22.3 to 69.9 percent for the solid samples and 20.9 to 51.5 percent for the liquid samples.

B2.1.3.8 Bulk Density and Specific Gravity. Bulk density was performed directly on the solid samples. The results of the bulk density measurements ranged from 1.24 g/mL to 1.79 g/mL.

Specific gravity was performed in duplicate directly on the drainable liquid samples. The results of the specific gravity measurements ranged from 1.40 to 1.45 (mean specific gravity was 1.42).

B2.2 RETAINED GAS SAMPLER RESULTS

Results of the retained gas analyses were presented in Mahoney et al. (1998). The RGS is a modified version of the core sampler used at the Hanford Site. It is designed to be used with the gas extraction equipment in the hot cell to capture and extrude a gas-containing waste sample in a hermetically sealed system. The retained gases are then extracted and stored in small gas canisters. The composition of the gases contained in the canisters is measured by mass spectroscopy. The total gas volume in the sample is obtained from analyzing the extraction process.

The retained gas inventories calculated from the local measurements of gas volume fraction made by the RGS can differ significantly from the total gas inventories estimated by the barometric pressure effect (BPE) or surface level rise methods. These discrepancies occur together with irregular waste layers and other strong indications of lateral inhomogeneity in the waste. Because the retained gas samples are localized, they capture little of this variation. Therefore, the BPE or surface level rise methods, which are related to the overall gas in the tank, must be used to supplement RGS measurements in estimating the gas inventories.

In tank 241-SX-106, the waste consisted of two distinct layers: an upper liquid layer 193 cm (76 in.) in thickness and a lower, high-solids, saltcake layer 333 cm (131 in.) in thickness. There was also a thin, dry saltcake crust on the surface of the liquid.

The RGS was used in risers 3 and 6 to sample seven segments. Both risers are near the tank center. Four retained gas samples were obtained from the solids layer and two from the liquid layer. The sample from riser 6, segment 6 (6:6) was taken by "slurping" the waste into the sampler (sucking the waste in by pressure differential without moving the sampler down through the waste). Subsequently, segment 6A was taken in the same location. While sampling riser 3, segment 10 (3:10), the piston was not pulled back as the sampler was pushed in, so the drill string was retracted and the procedure repeated correctly. All three of these samples should be considered as having been taken from disturbed waste and may not be comparable with other samples. While retrieving riser 6, segment 11 (6:11) the grapple cable broke, so the drill string and sampler had to be removed manually. The x-rays of the sampler indicated that it contained lithium bromide solution and air with no sample material present. No retake was requested.

Retained gas measurements showed the insoluble retained gases in tank 241-SX-106 had an average composition of 19 mol% nitrogen, 47 mol% hydrogen, 22 mol% nitrous oxide, and 11 mol% ammonia. The remainder of the gas content was comprised of methane and other hydrocarbons. The measured ammonia levels were unusually high, averaging between 30,000 and 130,000 μmol/L of waste (0.35 weight percent NH_3 in the liquid). The samples retained void fractions between 0.095 and 0.37, with much of the high-solids layer showing gas volume fractions greater than 0.30.

The average gas volume fraction in the 241-SX-106 solids layer, based on RGS data, is 0.28 ± 0.14. The total in situ gas inventory, based on this gas volume fraction plus the tiny amount of gas in the supernatant layer, corresponds to 360 ± 180 m^3. The in situ gas volume calculated from waste level and barometric pressure data is 190 ± 30 m^3 (Whitney at al. 1997). The surface level rise can also be considered as a measure of retained gas volume: the waste surface has risen a net 46 cm (18 in.) since 1981. This rise corresponds to an in situ gas accumulation of 190 m^3 (6,600 ft^3), which is consistent with the volume derived by the BPE method.

Because the RGS samples were taken from only four locations in the solids layer and the waste characteristics vary between the risers, the best estimate of the total gas inventory was considered to be that based on the BPE method. The BPE provides a global tank estimate of the retained gases, whereas the RGS method is localized to the sampling points. Additionally, the presence of a liquid layer covered by only a thin crust makes the waste level a very good indicator of the total gas inventory of the tank.

Table B2-6 contains the composition of the gas/vapor phase in each sample and the integrated average composition of retained gas in tank 241-SX-106. Sample 6:6A was not included because it was the second sampling attempt in the same location.

Table B2-6. Sample and Overall Average Compositions of Retained Gas with Gas Contamination Correction.[1]

Riser: Segment	N_2 (mol%)	H_2 (mol%)	N_2O (mol%)	NH_3 (mol%)	Other (mol%)
6:6	23 ± 3.2	49 ± 5.9	17 ± 2.6	8.5 ± 2.0	2.7 ± 1.6
6:9	17 ± 2.1	57 ± 5.1	16 ± 1.5	9.4 ± 4.2	0.6 ± 0.3
3:2	62 ± 13.0	21 ± 3.3	12 ± 1.9	0.96 ± 0.28	3.3 ± 1.6
3:4	64 ± 50.0	19 ± 9.6	14 ± 7.9	0.82 ± 0.54	1.9 ± 1.2
3:7	17 ± 5.8	44 ± 12.0	25 ± 11.0	13 ± 13.0	0.7 ± 0.3
3:10	20 ± 4.1	41 ± 5.1	26 ± 3.3	12 ± 6.3	0.9 ± 0.2
Average in the supernatant[2]	63 ± 36.0	20 ± 7.3	13 ± 5.3	0.88 ± 0.43	2.4 ± 1.3
Average in the solids layer[2]	19 ± 3.2	47 ± 3.8	22 ± 3.3	11 ± 1.7	0.9 ± 0.3

Notes:

[1]Mahoney et al. (1998)

[2]The error bands on the average composition, as for the individual sample compositions, only represent the instrument error resulting from not having enough samples to define the spatial variability of gas concentration.

B2.3 VAPOR PHASE MEASUREMENT

Vapor sampling and combustible gas testing were completed on March 24, 1995, to support the hazardous vapor safety screening DQO (Osborne and Buckley 1995). Results are shown in Tables B2-7 and B2-8.

In addition to the 1995 samples, headspace combustible gas measurements were obtained before the 1997 push mode core sampling of tank 241-SX-106. These measurements were taken to determine the LFL for the tank headspace at the time of sampling and to ensure safe operating conditions during sampling. A high LFL (>25 percent) was recorded in the drill string after retrieving segment 9. The drill string was purged using argon gas, and sampling resumed. Results of vapor phase measurements taken in the headspace of the tank are summarized in Table B2-7.

Table B2-7. Results of Headspace Measurements of Tank 241-SX-106.

Measurement	March 24, 1995[1]	October 13, 1997
LFL	0.0%	0.0%
Ammonia	150 ppmv	5.0 ppmv
Oxygen	21.0%	20.9%
TOC	5.5 ppmv	0.0 ppmv

Note:
[1]Caprio (1995)

Table B2-8. Results of March 24, 1995, Headspace Vapor Sample Analysis.[1] (2 sheets)

Category	Sample Medium	Analyte	Concentration	Units[2]
Inorganic analytes	Sorbent traps	NH_3	179.0±5.0	ppmv
		NO_2	≤0.02	ppmv
		NO	≤0.02	ppmv
		H_2O	14.9±0.07	mg/L
Permanent gases	SUMMA™ canister	H_2	<98.0	ppmv
		CO_2	107.0±3.0	ppmv
		CO	<12.0	ppmv
		N_2O	14.0	ppmv

Table B2-8. Results of March 24, 1995, Headspace Vapor Sample Analysis.[1] (2 sheets)

Category	Sample Medium	Analyte	Concentration	Units[2]
Organics	SUMMA™ canister	Acetone	0.021±0.001	ppmv
		1-Propanol	0.041±0.036	ppmv
		Tetrahydrofuran	0.007±0.0003	ppmv
		Pyridine	0.015±0.012	ppmv
		Methane	<12.0	ppmv
	Sorbent traps	Acetonitrile	0.018±0.001	ppmv
		Acetone	0.012±0.002	ppmv
		Vinylidene chloride	0.0050±0.0036	ppmv

Notes:
[1]Huckaby and Bratzel (1995)
[2]At 990 mbar (0.977 atm) and 30 °C (86 °F)

B2.3.1 Standard Hydrogen Monitoring System Results

Gas monitoring of the tank headspace is accomplished through the use of the SHMS and vapor grab samples. Continuously hydrogen measurements are taken through the Whittaker electrochemical cell, which is hydrogen specific. The maximum hydrogen concentration measured by the SHMS was 330 ppmv on December 12, 1995 (Wilkins et al. 1997). Vapor grab samples are taken periodically to confirm the SHMS hydrogen readings and to obtain additional information about other gases in the tank. The other gases measured are nitrous oxide, which is an oxidizer, and methane, which is flammable. The average hydrogen concentration between August 25, 1995, and May 20, 1998 was 43.4 ppmv, the minimum was 8 ppmv, and the maximum was 160 ppmv. The average methane concentration was 2.75 ppmv, and the average nitrous oxide concentrations was 28.7 ppmv.

B2.4 DESCRIPTION OF HISTORICAL SAMPLING EVENTS

Analyses of sampling events for tank 241-SX-106 were obtained from historical records. Several grab samples were obtained from tank 241-SX-106 between December 1974 and November 1979 in support of process engineering operations. Supernatant and evaporator feed were removed from tank 241-SX-106 from 1978 to 1980, and the tank received evaporator bottoms and evaporator feed. As a result, pre-1980 samples do not represent current tank contents and are not included in this report. Reference to these historical sampling events can be found in Appendix E.

1997 PUSH CORE DATA TABLES

Table B2-9. Tank 241-SX-106 Analytical Results: Aluminum (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S98T000695	223:6	Whole	11,800	11,900	11,900
S98T000705	223:6A	Whole	14,000	10,600	12,300[QC:c,e,h]
S98T000706	223:9	Whole	10,600	10,400	10,500
S98T000721	224:2	Whole	8,120	8,260	8,190[QC:d]
S98T000722	224:4	Whole	8,620	8,580	8,600
S98T000723	224:7	Whole	9,020	9,410	9,220
S98T000724	224:10	Whole	11,100	10,900	11,000
Solids: fusion			µg/g	µg/g	µg/g
S97T002177	223:1	Lower half	8,390	4,750	6,570[QC:e]
S97T002185	223:2	Lower half	13,700	14,200	14,000
S97T002194	223:3	Lower half	5,950	6,300	6,130
S97T002204	223:4	Lower half	7,720	5,280	6,500[QC:e]
S97T002231	223:5	Lower half	17,700	18,500	18,100
S98T000694	223:6	Whole	11,900	11,900	11,900
S98T000703	223:6A	Whole	13,900	14,200	14,100
S97T002233	223:7	Upper half	30,800	30,900	30,900
S97T002232		Lower half	25,400	26,000	25,700
S97T002235	223:8	Upper half	30,200	29,200	29,700
S97T002234		Lower half	19,400	20,700	20,100
S98T000704	223:9	Whole	10,200	12,300	11,300
S97T002265	223:10	Upper half	21,000	22,500	21,800
S97T002263		Lower half	24,700	24,400	24,600
S97T002320	224:1	Lower half	14,100	14,400	14,300
S98T000717	224:2	Whole	8,970	8,780	8,880
S97T002334	224:3	Lower half	14,000	13,000	13,500
S98T000718	224:4	Whole	9,500	9,430	9,470

Table B2-9. Tank 241-SX-106 Analytical Results: Aluminum (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			μg/g	μg/g	μg/g
S97T002360	224:5	Upper half	12,100	15,000	13,600[QC:e]
S97T002359		Lower half	25,000	24,500	24,800
S97T002362	224:6	Upper half	30,100	29,700	29,900
S97T002361		Lower half	31,400	31,000	31,200
S98T000719	224:7	Whole	9,740	9,870	9,810
S97T002364	224:8	Upper half	22,600	24,300	23,500
S97T002363		Lower half	29,300	26,400	27,900
S97T002392	224:9	Upper half	18,900	18,400	18,700
S97T002387		Lower half	24,100	23,600	23,900
S98T000720	224:10	Whole	12,900	11,600	12,300
S97T002402	224:11	Upper half	36,800	36,800	36,800
S97T002397		Lower half	24,500	23,400	24,000
Liquids			μg/mL	μg/mL	μg/mL
S97T002179	223:1	Drainable liquid	25,600	24,600	25,100
S97T002188	223:2	Drainable liquid	25,400	23,700	24,600
S97T002199	223:3	Drainable liquid	26,400	26,500	26,500[QC:c]
S97T002200	223:4	Drainable liquid	25,800	24,800	25,300[QC:c]
S97T002215	223:5	Drainable liquid	29,400	28,600	29,000
S97T002323	224:1	Drainable liquid	26,300	26,800	26,600[QC:c]
S97T002371	224:3	Drainable liquid	24,900	25,200	25,100
S97T002372	224:5	Drainable liquid	24,900	25,300	25,100[QC:d]

Table B2-10. Tank 241-SX-106 Analytical Results: Antimony (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			$\mu g/g$	$\mu g/g$	$\mu g/g$
S98T000695	223:6	Whole	<24.1	<22.6	<23.4
S98T000705	223:6A	Whole	<22.5	<23.6	<23.1
S98T000706	223:9	Whole	<22.8	<22.6	<22.7
S98T000721	224:2	Whole	<14.5	<10.5	<12.5
S98T000722	224:4	Whole	<11.7	<11.5	<11.6
S98T000723	224:7	Whole	<23.6	<23.3	<23.5
S98T000724	224:10	Whole	<21.6	<21.2	<21.4
Solids: fusion			$\mu g/g$	$\mu g/g$	$\mu g/g$
S97T002177	223:1	Lower half	<1,250	<1,220	<1,240
S97T002185	223:2	Lower half	<1,150	<1,130	<1,140
S97T002194	223:3	Lower half	<1,130	<1,120	<1,130
S97T002204	223:4	Lower half	<1,320	<1,290	<1,310
S97T002231	223:5	Lower half	<1,110	<1,140	<1,130
S98T000694	223:6	Whole	<1,160	<1,140	<1,150
S98T000703	223:6A	Whole	<1,110	<1,130	<1,120
S97T002233	223:7	Upper half	<1,260	<1,200	<1,230
S97T002232		Lower half	<1,180	<1,220	<1,200
S97T002235	223:8	Upper half	<1,220	<1,210	<1,220
S97T002234		Lower half	<1,190	<1,200	<1,200
S98T000704	223:9	Whole	<1,210	<1,220	<1,220
S97T002265	223:10	Upper half	<1,180	<1,180	<1,180
S97T002263		Lower half	<1,230	<1,230	<1,230
S97T002320	224:1	Lower half	<1,140	<1,110	<1,130
S98T000717	224:2	Whole	<1,210	<1,170	<1,190
S97T002334	224:3	Lower half	<1,100	<1,110	<1,110
S98T000718	224:4	Whole	<1,210	<1,190	<1,200
S97T002360	224:5	Upper half	<1,200	<1,220	<1,210
S97T002359		Lower half	<1,210	<1,200	<1,210
S97T002362	224:6	Upper half	<1,090	<1,050	<1,070
S97T002361		Lower half	<1,160	<1,170	<1,170

Table B2-10. Tank 241-SX-106 Analytical Results: Antimony (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			µg/g	µg/g	µg/g
S98T000719	224:7	Whole	<1,160	<1,200	<1,180
S97T002364	224:8	Upper half	<1,210	<1,200	<1,210
S97T002363		Lower half	<1,110	<1,090	<1,100
S97T002392	224:9	Upper half	<1,310	<1,310	<1,310
S97T002387		Lower half	<1,340	<1,340	<1,340
S98T000720	224:10	Whole	<1,180	<1,170	<1,180
S97T002402	224:11	Upper half	<1,210	<1,200	<1,210
S97T002397		Lower half	<1,180	<1,150	<1,170
Liquids			µg/mL	µg/mL	µg/mL
S97T002179	223:1	Drainable liquid	<36.1	<36.1	<36.1
S97T002188	223:2	Drainable liquid	<36.1	<36.1	<36.1
S97T002199	223:3	Drainable liquid	<36.1	<36.1	<36.1
S97T002200	223:4	Drainable liquid	<36.1	<36.1	<36.1
S97T002215	223:5	Drainable liquid	<36.1	<36.1	<36.1
S97T002323	224:1	Drainable liquid	<36.1	<36.1	<36.1
S97T002371	224:3	Drainable liquid	<36.1	<36.1	<36.1
S97T002372	224:5	Drainable liquid	<36.1	<36.1	<36.1

Table B2-11. Tank 241-SX-106 Analytical Results: Arsenic (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S98T000695	223:6	Whole	<40.1	<37.6	<38.9
S98T000705	223:6A	Whole	<37.5	<39.3	<38.4
S98T000706	223:9	Whole	<38	<37.6	<37.8
S98T000721	224:2	Whole	<24.2	<17.5	<20.9
S98T000722	224:4	Whole	<19.4	<19.2	<19.3
S98T000723	224:7	Whole	<39.3	<38.8	<39
S98T000724	224:10	Whole	<36	<35.3	<35.6
Solids: fusion			µg/g	µg/g	µg/g
S97T002177	223:1	Lower half	<2,080	<2,040	<2,060
S97T002185	223:2	Lower half	<1,920	<1,890	<1,910
S97T002194	223:3	Lower half	<1,880	<1,870	<1,880
S97T002204	223:4	Lower half	<2,200	<2,150	<2,180
S97T002231	223:5	Lower half	<1,840	<1,900	<1,870
S98T000694	223:6	Whole	<1,930	<1,890	<1,910
S98T000703	223:6A	Whole	<1,850	<1,890	<1,870
S97T002233	223:7	Upper half	<2,100	<2,000	<2,050
S97T002232		Lower half	<1,960	<2,030	<2,000
S97T002235	223:8	Upper half	<2,030	<2,020	<2,030
S97T002234		Lower half	<1,980	<2,010	<2,000
S98T000704	223:9	Whole	<2,020	<2,040	<2,030
S97T002265	223:10	Upper half	<1,970	<1,970	<1,970
S97T002263		Lower half	<2,050	<2,050	<2,050
S97T002320	224:1	Lower half	<1,900	<1,850	<1,880
S98T000717	224:2	Whole	<2,020	<1,950	<1,990
S97T002334	224:3	Lower half	<1,830	<1,850	<1,840
S98T000718	224:4	Whole	<2,010	<1,990	<2,000
S97T002360	224:5	Upper half	<2,000	<2,040	<2,020
S97T002359		Lower half	<2,020	<2,000	<2,010
S97T002362	224:6	Upper half	<1,820	<1,750	<1,790
S97T002361		Lower half	<1,930	<1,960	<1,950

Table B2-11. Tank 241-SX-106 Analytical Results: Arsenic (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			μg/g	μg/g	μg/g
S98T000719	224:7	Whole	<1,930	<2,000	<1,970
S97T002364	224:8	Upper half	<2,020	<2,010	<2,020
S97T002363		Lower half	<1,850	<1,810	<1,830
S97T002392	224:9	Upper half	<2,190	<2,190	<2,190
S97T002387		Lower half	<2,230	<2,240	<2,240
S98T000720	224:10	Whole	<1,960	<1,950	<1,960
S97T002402	224:11	Upper half	<2,010	<2,010	<2,010
S97T002397		Lower half	<1,970	<1,920	<1,950
Liquids			μg/mL	μg/mL	μg/mL
S97T002179	223:1	Drainable liquid	<60.1	<60.1	<60.1
S97T002188	223:2	Drainable liquid	<60.1	<60.1	<60.1
S97T002199	223:3	Drainable liquid	<60.1	<60.1	<60.1
S97T002200	223:4	Drainable liquid	<60.1	<60.1	<60.1
S97T002215	223:5	Drainable liquid	<60.1	<60.1	<60.1
S97T002323	224:1	Drainable liquid	<60.1	<60.1	<60.1
S97T002371	224:3	Drainable liquid	<60.1	<60.1	<60.1
S97T002372	224:5	Drainable liquid	<60.1	<60.1	<60.1

Table B2-12. Tank 241-SX-106 Analytical Results: Barium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S98T000695	223:6	Whole	<20.1	<18.8	<19.5
S98T000705	223:6A	Whole	<18.7	<19.6	<19.1
S98T000706	223:9	Whole	<19	<18.8	<18.9
S98T000721	224:2	Whole	<12.1	<8.76	<10.4
S98T000722	224:4	Whole	<9.72	<9.58	<9.65
S98T000723	224:7	Whole	<19.7	<19.4	<19.5
S98T000724	224:10	Whole	<18	<17.7	<17.9
Solids: fusion			µg/g	µg/g	µg/g
S97T002177	223:1	Lower half	<1,040	<1,020	<1,030
S97T002185	223:2	Lower half	<958	<946	<952
S97T002194	223:3	Lower half	<939	<934	<937
S97T002204	223:4	Lower half	<1,100	<1,070	<1,090
S97T002231	223:5	Lower half	<922	<951	<937
S98T000694	223:6	Whole	<965	<946	<956
S98T000703	223:6A	Whole	<926	<943	<935
S97T002233	223:7	Upper half	<1,050	<1,000	<1,030
S97T002232		Lower half	<979	<1,010	<995
S97T002235	223:8	Upper half	<1,010	<1,010	<1,010
S97T002234		Lower half	<992	<1,000	<996
S98T000704	223:9	Whole	<1,010	<1,020	<1,020
S97T002265	223:10	Upper half	<985	<984	<985
S97T002263		Lower half	<1,020	<1,030	<1,030
S97T002320	224:1	Lower half	<950	<923	<937
S98T000717	224:2	Whole	<1,010	<976	<993
S97T002334	224:3	Lower half	<914	<923	<919
S98T000718	224:4	Whole	<1,010	<995	<1,000
S97T002360	224:5	Upper half	<999	<1,020	<1,010
S97T002359		Lower half	<1,010	<999	<1,000
S97T002362	224:6	Upper half	<910	<873	<892
S97T002361		Lower half	<967	<978	<973

Table B2-12. Tank 241-SX-106 Analytical Results: Barium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			μg/g	μg/g	μg/g
S98T000719	224:7	Whole	<967	<999	<983
S97T002364	224:8	Upper half	<1,010	<1,000	<1,010
S97T002363		Lower half	<923	<905	<914
S97T002392	224:9	Upper half	<1,090	<1,100	<1,100
S97T002387		Lower half	<1,120	<1,120	<1,120
S98T000720	224:10	Whole	<982	<976	<979
S97T002402	224:11	Upper half	<1,010	<1,000	<1,010
S97T002397		Lower half	<984	<962	<973
Liquids			μg/mL	μg/mL	μg/mL
S97T002179	223:1	Drainable liquid	<30.1	<30.1	<30.1
S97T002188	223:2	Drainable liquid	<30.1	<30.1	<30.1
S97T002199	223:3	Drainable liquid	<30.1	<30.1	<30.1
S97T002200	223:4	Drainable liquid	<30.1	<30.1	<30.1
S97T002215	223:5	Drainable liquid	<30.1	<30.1	<30.1
S97T002323	224:1	Drainable liquid	<30.1	<30.1	<30.1
S97T002371	224:3	Drainable liquid	<30.1	<30.1	<30.1
S97T002372	224:5	Drainable liquid	<30.1	<30.1	<30.1

Table B2-13. Tank 241-SX-106 Analytical Results: Beryllium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S98T000695	223:6	Whole	<2.01	<1.88	<1.94
S98T000705	223:6A	Whole	<1.87	<1.96	<1.92
S98T000706	223:9	Whole	<1.9	<1.88	<1.89
S98T000721	224:2	Whole	<1.21	<0.876	<1.04
S98T000722	224:4	Whole	<0.972	<0.958	<0.965
S98T000723	224:7	Whole	<1.97	<1.94	<1.96
S98T000724	224:10	Whole	<1.8	<1.77	<1.79
Solids: fusion			µg/g	µg/g	µg/g
S97T002177	223:1	Lower half	<104	<102	<103
S97T002185	223:2	Lower half	<95.8	<94.6	<95.2
S97T002194	223:3	Lower half	<93.9	<93.4	<93.7
S97T002204	223:4	Lower half	<110	<107	<109
S97T002231	223:5	Lower half	<92.2	<95.1	<93.7
S98T000694	223:6	Whole	<96.5	<94.6	<95.5
S98T000703	223:6A	Whole	<92.6	<94.3	<93.4
S97T002233	223:7	Upper half	<105	<100	<103
S97T002232		Lower half	<97.9	<101	<99.5
S97T002235	223:8	Upper half	<101	<101	<101
S97T002234		Lower half	<99.2	<100	<99.6
S98T000704	223:9	Whole	<101	<102	<102
S97T002265	223:10	Upper half	<98.5	<98.4	<98.5
S97T002263		Lower half	<102	<103	<103
S97T002320	224:1	Lower half	<95	<92.3	<93.7
S98T000717	224:2	Whole	<101	<97.6	<99.3
S97T002334	224:3	Lower half	<91.4	<92.3	<91.8
S98T000718	224:4	Whole	<101	<99.5	<100
S97T002360	224:5	Upper half	<99.9	<102	<101
S97T002359		Lower half	<101	<99.9	<100
S97T002362	224:6	Upper half	<91	<87.3	<89.2
S97T002361		Lower half	<96.7	<97.8	<97.3

Table B2-13. Tank 241-SX-106 Analytical Results: Beryllium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			µg/g	µg/g	µg/g
S98T000719	224:7	Whole	<96.7	<99.9	<98.3
S97T002364	224:8	Upper half	<101	<100	<101
S97T002363		Lower half	<92.3	<90.5	<91.4
S97T002392	224:9	Upper half	<109	<110	<110
S97T002387		Lower half	<112	<112	<112
S98T000720	224:10	Whole	<98.2	<97.6	<97.9
S97T002402	224:11	Upper half	<101	<100	<101
S97T002397		Lower half	<98.4	<96.2	<97.3
Liquids			µg/mL	µg/mL	µg/mL
S97T002179	223:1	Drainable liquid	<3	<3	<3
S97T002188	223:2	Drainable liquid	<3	<3	<3
S97T002199	223:3	Drainable liquid	<3	<3	<3
S97T002200	223:4	Drainable liquid	<3	<3	<3
S97T002215	223:5	Drainable liquid	<3	<3	<3
S97T002323	224:1	Drainable liquid	<3	<3	<3
S97T002371	224:3	Drainable liquid	<3	<3	<3
S97T002372	224:5	Drainable liquid	<3	<3	<3

Table B2-14. Tank 241-SX-106 Analytical Results: Bismuth (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S98T000695	223:6	Whole	<40.1	<37.6	<38.9
S98T000705	223:6A	Whole	<37.5	<39.3	<38.4
S98T000706	223:9	Whole	<38	<37.6	<37.8
S98T000721	224:2	Whole	<24.2	<17.5	<20.9
S98T000722	224:4	Whole	<19.4	<19.2	<19.3
S98T000723	224:7	Whole	<39.3	<38.8	<39
S98T000724	224:10	Whole	<36	<35.3	<35.6
Solids: fusion			µg/g	µg/g	µg/g
S97T002177	223:1	Lower half	<2,080	<2,040	<2,060
S97T002185	223:2	Lower half	<1,920	<1,890	<1,910
S97T002194	223:3	Lower half	<1,880	<1,870	<1,880
S97T002204	223:4	Lower half	<2,200	<2,150	<2,180
S97T002231	223:5	Lower half	<1,840	<1,900	<18,70
S98T000694	223:6	Whole	<1,930	<1,890	<1,910
S98T000703	223:6A	Whole	<1,850	<1,890	<1,870
S97T002233	223:7	Upper half	<2,100	<2,000	<2,050
S97T002232		Lower half	<1,960	<2,030	<2,000
S97T002235	223:8	Upper half	<2,030	<2,020	<2,030
S97T002234		Lower half	<1,980	<2,010	<2,000
S98T000704	223:9	Whole	<2,020	<2,040	<2,030
S97T002265	223:10	Upper half	<1,970	<1,970	<1,970
S97T002263		Lower half	<2,050	<2,050	<2,050
S97T002320	224:1	Lower half	<1,900	<1,850	<1,880
S98T000717	224:2	Whole	<2,020	<1,950	<1,990
S97T002334	224:3	Lower half	<1,830	<1,850	<1,840
S98T000718	224:4	Whole	<2,010	<1,990	<2,000
S97T002360	224:5	Upper half	<2,000	<2,040	<2,020
S97T002359		Lower half	<2,020	<2,000	<2,010
S97T002362	224:6	Upper half	<1,820	<1,750	<1,790
S97T002361		Lower half	<1,930	<1,960	<1,950

Table B2-14. Tank 241-SX-106 Analytical Results: Bismuth (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			µg/g	µg/g	µg/g
S98T000719	224:7	Whole	<1,930	<2,000	<1,970
S97T002364	224:8	Upper half	<2,020	<2,010	<2,020
S97T002363		Lower half	<1,850	<1,810	<1,830
S97T002392	224:9	Upper half	<2,190	<2,190	<2,190
S97T002387		Lower half	<2,230	<2,240	<2,240
S98T000720	224:10	Whole	<1,960	<1,950	<1,960
S97T002402	224:11	Upper half	<2,010	<2,010	<2,010
S97T002397		Lower half	<1,970	<1,920	<1,950
Liquids			µg/mL	µg/mL	µg/mL
S97T002179	223:1	Drainable liquid	<60.1	<60.1	<60.1
S97T002188	223:2	Drainable liquid	<60.1	<60.1	<60.1
S97T002199	223:3	Drainable liquid	<60.1	<60.1	<60.1
S97T002200	223:4	Drainable liquid	<60.1	<60.1	<60.1
S97T002215	223:5	Drainable liquid	<60.1	<60.1	<60.1
S97T002323	224:1	Drainable liquid	<60.1	<60.1	<60.1
S97T002371	224:3	Drainable liquid	<60.1	<60.1	<60.1
S97T002372	224:5	Drainable liquid	<60.1	<60.1	<60.1

Table B2-15. Tank 241-SX-106 Analytical Results: Boron (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			$\mu g/g$	$\mu g/g$	$\mu g/g$
S98T000695	223:6	Whole	193	146	170[QC:e]
S98T000705	223:6A	Whole	127	131	129
S98T000706	223:9	Whole	161	124	143[QC:e]
S98T000721	224:2	Whole	134	133	134
S98T000722	224:4	Whole	130	113	122
S98T000723	224:7	Whole	149	145	147
S98T000724	224:10	Whole	141	107	124[QC:e]
Solids: fusion			$\mu g/g$	$\mu g/g$	$\mu g/g$
S97T002177	223:1	Lower half	<1,040	<1,020	<1,030
S97T002185	223:2	Lower half	<958	<946	<952
S97T002194	223:3	Lower half	<939	<934	<937
S97T002204	223:4	Lower half	<1,100	<1,070	<1,090
S97T002231	223:5	Lower half	<922	<951	<937
S98T000694	223:6	Whole	<965	<946	<956
S98T000703	223:6A	Whole	<926	<943	<935
S97T002233	223:7	Upper half	<1,050	<1,000	<1,030
S97T002232		Lower half	<979	<1,010	<995
S97T002235	223:8	Upper half	<1,010	<1,010	<1,010
S97T002234		Lower half	<992	<1,000	<996
S98T000704	223:9	Whole	<1,010	<1,020	<1,020
S97T002265	223:10	Upper half	<985	<984	<985
S97T002263		Lower half	<1,020	<1,030	<1,030
S97T002320	224:1	Lower half	<950	<923	<937
S98T000717	224:2	Whole	<1,010	<976	<993
S97T002334	224:3	Lower half	<914	<923	<919
S98T000718	224:4	Whole	<1,010	<995	<1,000
S97T002360	224:5	Upper half	<999	<1,020	<1,010
S97T002359		Lower half	<1,010	<999	<1,000
S97T002362	224:6	Upper half	<910	<873	<892
S97T002361		Lower half	<967	<978	<973

Table B2-15. Tank 241-SX-106 Analytical Results: Boron (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			μg/g	μg/g	μg/g
S98T000719	224:7	Whole	<967	<999	<983
S97T002364	224:8	Upper half	<1,010	<1,000	<1,010
S97T002363		Lower half	<923	<905	<914
S97T002392	224:9	Upper half	<1,090	<1,100	<1,100
S97T002387		Lower half	<1,120	<1,120	<1,120
S98T000720	224:10	Whole	<982	<976	<979
S97T002402	224:11	Upper half	<1,010	<1,000	<1,010
S97T002397		Lower half	<984	<962	<973
Liquids			μg/mL	μg/mL	μg/mL
S97T002179	223:1	Drainable liquid	94.7	87.1	90.9
S97T002188	223:2	Drainable liquid	92.1	86.3	89.2
S97T002199	223:3	Drainable liquid	94.7	94.9	94.8
S97T002200	223:4	Drainable liquid	95.9	91.9	93.9
S97T002215	223:5	Drainable liquid	96.7	93.1	94.9
S97T002323	224:1	Drainable liquid	99.9	100	100
S97T002371	224:3	Drainable liquid	95.1	96.4	95.8
S97T002372	224:5	Drainable liquid	87.1	88.4	87.8

Table B2-16. Tank 241-SX-106 Analytical Results: Cadmium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S98T000695	223:6	Whole	3.54	4	3.77
S98T000705	223:6A	Whole	5.3	3.76	4.53[QC:e]
S98T000706	223:9	Whole	4.27	4.01	4.14
S98T000721	224:2	Whole	<1.21	<0.876	<1.04
S98T000722	224:4	Whole	<0.972	<0.958	<0.965
S98T000723	224:7	Whole	2.43	2.78	2.61
S98T000724	224:10	Whole	3.52	3.56	3.54
Solids: fusion			µg/g	µg/g	µg/g
S97T002177	223:1	Lower half	<104	<102	<103
S97T002185	223:2	Lower half	<95.8	<94.6	<95.2
S97T002194	223:3	Lower half	<93.9	<93.4	<93.7
S97T002204	223:4	Lower half	<110	<107	<109
S97T002231	223:5	Lower half	<92.2	<95.1	<93.7
S98T000694	223:6	Whole	<96.5	<94.6	<95.5
S98T000703	223:6A	Whole	<92.6	<94.3	<93.4
S97T002233	223:7	Upper half	<105	<100	<103
S97T002232		Lower half	<97.9	<101	<99.5
S97T002235	223:8	Upper half	<101	<101	<101
S97T002234		Lower half	<99.2	<100	<99.6
S98T000704	223:9	Whole	<101	<102	<102
S97T002265	223:10	Upper half	<98.5	<98.4	<98.5
S97T002263		Lower half	<102	<103	<103
S97T002320	224:1	Lower half	<95	<92.3	<93.7
S98T000717	224:2	Whole	<101	<97.6	<99.3
S97T002334	224:3	Lower half	<91.4	<92.3	<91.8
S98T000718	224:4	Whole	<101	<99.5	<100
S97T002360	224:5	Upper half	<99.9	<102	<101
S97T002359		Lower half	<101	<99.9	<100
S97T002362	224:6	Upper half	<91	<87.3	<89.2
S97T002361		Lower half	<96.7	<97.8	<97.3

Table B2-16. Tank 241-SX-106 Analytical Results: Cadmium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			μg/g	μg/g	μg/g
S98T000719	224:7	Whole	<96.7	<99.9	<98.3
S97T002364	224:8	Upper half	<101	<100	<101
S97T002363		Lower half	<92.3	<90.5	<91.4
S97T002392	224:9	Upper half	<109	<110	<110
S97T002387		Lower half	<112	<112	<112
S98T000720	224:10	Whole	<98.2	<97.6	<97.9
S97T002402	224:11	Upper half	<101	<100	<101
S97T002397		Lower half	<98.4	<96.2	<97.3
Liquids			μg/mL	μg/mL	μg/mL
S97T002179	223:1	Drainable liquid	<3	<3	<3
S97T002188	223:2	Drainable liquid	<3	<3	<3
S97T002199	223:3	Drainable liquid	<3	<3	<3
S97T002200	223:4	Drainable liquid	<3	<3	<3
S97T002215	223:5	Drainable liquid	<3	<3	<3
S97T002323	224:1	Drainable liquid	<3	<3	<3
S97T002371	224:3	Drainable liquid	<3	<3	<3
S97T002372	224:5	Drainable liquid	<3	<3	<3

Table B2-17. Tank 241-SX-106 Analytical Results: Calcium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S98T000695	223:6	Whole	167	202	185
S98T000705	223:6A	Whole	234	128	181[QC:e]
S98T000706	223:9	Whole	174	122	148[QC:e]
S98T000721	224:2	Whole	141	78.5	110
S98T000722	224:4	Whole	163	98.4	131[QC:e]
S98T000723	224:7	Whole	148	163	156
S98T000724	224:10	Whole	108	167	138[QC:e]
Solids: fusion			µg/g	µg/g	µg/g
S97T002177	223:1	Lower half	<2,080	<2,040	<2,060
S97T002185	223:2	Lower half	<1,920	<1,890	<1,910
S97T002194	223:3	Lower half	<1,880	<1,870	<1,880
S97T002204	223:4	Lower half	<2,200	<2,150	<2,180
S97T002231	223:5	Lower half	<1,840	<1,900	<1,870
S98T000694	223:6	Whole	<1,930	<1,890	<1,910
S98T000703	223:6A	Whole	<1,850	<1,890	<1,870
S97T002233	223:7	Upper half	<2,100	<2,000	<2,050
S97T002232		Lower half	<1,960	<2,030	<2,000
S97T002235	223:8	Upper half	<2,030	<2,020	<2,030
S97T002234		Lower half	<1,980	<2,010	<2,000
S98T000704	223:9	Whole	<2,020	<2,040	<2,030
S97T002265	223:10	Upper half	<1,970	<1,970	<1,970
S97T002263		Lower half	<2,050	<2,050	<2,050
S97T002320	224:1	Lower half	<1,900	<1,850	<1,880
S98T000717	224:2	Whole	<2,020	<1,950	<1,990
S97T002334	224:3	Lower half	<1,830	<1,850	<1,840
S98T000718	224:4	Whole	<2,010	<1,990	<2,000
S97T002360	224:5	Upper half	<2,000	<2,040	<2,020
S97T002359		Lower half	<2,020	<2,000	<2,010
S97T002362	224:6	Upper half	<1,820	<1,750	<1,790
S97T002361		Lower half	<1,930	<1,960	<1,950

Table B2-17. Tank 241-SX-106 Analytical Results: Calcium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			µg/g	µg/g	µg/g
S98T000719	224:7	Whole	5,330	<2,000	<3,670[QC:c,e]
S97T002364	224:8	Upper half	<2,020	<2,010	<2,020
S97T002363		Lower half	<1,850	<1,810	<1,830
S97T002392	224:9	Upper half	<2,190	<2,190	<2,190
S97T002387		Lower half	<2,230	<2,240	<2,240
S98T000720	224:10	Whole	<1,960	<1,950	<1,960
S97T002402	224:11	Upper half	<2,010	<2,010	<2,010
S97T002397		Lower half	<1,970	<1,920	<1,950
Liquids			µg/mL	µg/mL	µg/mL
S97T002179	223:1	Drainable liquid	<60.1	<60.1	<60.1
S97T002188	223:2	Drainable liquid	<60.1	<60.1	<60.1
S97T002199	223:3	Drainable liquid	<60.1	<60.1	<60.1
S97T002200	223:4	Drainable liquid	<60.1	<60.1	<60.1
S97T002215	223:5	Drainable liquid	<60.1	<60.1	<60.1
S97T002323	224:1	Drainable liquid	<60.1	<60.1	<60.1
S97T002371	224:3	Drainable liquid	<60.1	<60.1	<60.1
S97T002372	224:5	Drainable liquid	<60.1	<60.1	<60.1

Table B2-18. Tank 241-SX-106 Analytical Results: Cerium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S98T000695	223:6	Whole	<40.1	<37.6	<38.9
S98T000705	223:6A	Whole	<37.5	<39.3	<38.4
S98T000706	223:9	Whole	<38	<37.6	<37.8
S98T000721	224:2	Whole	<24.2	<17.5	<20.9
S98T000722	224:4	Whole	<19.4	<19.2	<19.3
S98T000723	224:7	Whole	<39.3	<38.8	<39
S98T000724	224:10	Whole	<36	<35.3	<35.6
Solids: fusion			µg/g	µg/g	µg/g
S97T002177	223:1	Lower half	<2,080	<2,040	<2,060
S97T002185	223:2	Lower half	<1,920	<1,890	<1,910
S97T002194	223:3	Lower half	<1,880	<1,870	<1,880
S97T002204	223:4	Lower half	<2,200	<2,150	<2,180
S97T002231	223:5	Lower half	<1,840	<1,900	<1,870
S98T000694	223:6	Whole	<1,930	<1,890	<1,910
S98T000703	223:6A	Whole	<1,850	<1,890	<1,870
S97T002233	223:7	Upper half	<2,100	<2,000	<2,050
S97T002232		Lower half	<1,960	<2,030	<2,000
S97T002235	223:8	Upper half	<2,030	<2,020	<2,030
S97T002234		Lower half	<1,980	<2,010	<2,000
S98T000704	223:9	Whole	<2,020	<2,040	<2,030
S97T002265	223:10	Upper half	<1,970	<1,970	<1,970
S97T002263		Lower half	<2,050	<2,050	<2,050
S97T002320	224:1	Lower half	<1,900	<1,850	<1,880
S98T000717	224:2	Whole	<2,020	<1,950	<1,990
S97T002334	224:3	Lower half	<1,830	<1,850	<1,840
S98T000718	224:4	Whole	<2,010	<1,990	<2,000
S97T002360	224:5	Upper half	<2,000	<2,040	<2,020
S97T002359		Lower half	<2,020	<2,000	<2,010
S97T002362	224:6	Upper half	<1,820	<1,750	<1,790
S97T002361		Lower half	<1,930	<1,960	<1,950

Table B2-18. Tank 241-SX-106 Analytical Results: Cerium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			**μg/g**	**μg/g**	**μg/g**
S98T000719	224:7	Whole	<1,930	<2,000	<1,970
S97T002364	224:8	Upper half	<2,020	<2,010	<2,020
S97T002363		Lower half	<1,850	<1,810	<1,830
S97T002392	224:9	Upper half	<2,190	<2,190	<2,190
S97T002387		Lower half	<2,230	<2,240	<2,240
S98T000720	224:10	Whole	<1,960	<1,950	<1,960
S97T002402	224:11	Upper half	<2,010	<2,010	<2,010
S97T002397		Lower half	<1,970	<1,920	<1,950
Liquids			**μg/mL**	**μg/mL**	**μg/mL**
S97T002179	223:1	Drainable liquid	<60.1	<60.1	<60.1
S97T002188	223:2	Drainable liquid	<60.1	<60.1	<60.1
S97T002199	223:3	Drainable liquid	<60.1	<60.1	<60.1
S97T002200	223:4	Drainable liquid	<60.1	<60.1	<60.1
S97T002215	223:5	Drainable liquid	<60.1	<60.1	<60.1
S97T002323	224:1	Drainable liquid	<60.1	<60.1	<60.1
S97T002371	224:3	Drainable liquid	<60.1	<60.1	<60.1
S97T002372	224:5	Drainable liquid	<60.1	<60.1	<60.1

Table B2-19. Tank 241-SX-106 Analytical Results: Chromium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S98T000695	223:6	Whole	2,950	2,990	2,970
S98T000705	223:6A	Whole	4,210	2,810	3,510[QC:c,e,h]
S98T000706	223:9	Whole	2,810	2,700	2,760
S98T000721	224:2	Whole	40.8	41.5	41.1
S98T000722	224:4	Whole	43.9	43.9	43.9
S98T000723	224:7	Whole	1,790	1,970	1,880[QC:c]
S98T000724	224:10	Whole	1,770	1,670	1,720
Solids: fusion			µg/g	µg/g	µg/g
S97T002177	223:1	Lower half	<208	<204	<206
S97T002185	223:2	Lower half	<192	<189	<191
S97T002194	223:3	Lower half	<188	<187	<188
S97T002204	223:4	Lower half	531	360	446[QC:e]
S97T002231	223:5	Lower half	947	1,070	1,010
S98T000694	223:6	Whole	2,910	2,930	2,920
S98T000703	223:6A	Whole	3,900	4,060	3,980
S97T002233	223:7	Upper half	9,850	9,730	9,790
S97T002232		Lower half	8,060	8,380	8,220
S97T002235	223:8	Upper half	3,780	3,770	3,780
S97T002234		Lower half	2,740	2,870	2,810
S98T000704	223:9	Whole	2,670	3,350	3,010[QC:e]
S97T002265	223:10	Upper half	4,510	4,760	4,640
S97T002263		Lower half	6,160	5,970	6,070
S97T002320	224:1	Lower half	<190	<185	<188
S98T000717	224:2	Whole	<202	<195	<199
S97T002334	224:3	Lower half	<183	<185	<184
S98T000718	224:4	Whole	<201	<199	<200
S97T002360	224:5	Upper half	496	475	486
S97T002359		Lower half	7,230	8,040	7,640
S97T002362	224:6	Upper half	8,150	8,540	8,350
S97T002361		Lower half	8,400	8,750	8,580

Table B2-19. Tank 241-SX-106 Analytical Results: Chromium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			µg/g	µg/g	µg/g
S98T000719	224:7	Whole	2,130	2,260	2,200
S97T002364	224:8	Upper half	7,290	7,970	7,630
S97T002363		Lower half	8,030	7,470	7,750
S97T002392	224:9	Upper half	4,310	4,230	4,270
S97T002387		Lower half	9,010	8,420	8,720
S98T000720	224:10	Whole	2,450	2,000	2,230[QC:e]
S97T002402	224:11	Upper half	4,450	4,500	4,480
S97T002397		Lower half	5,920	5,890	5,910
Liquids			µg/mL	µg/mL	µg/mL
S97T002179	223:1	Drainable liquid	131	127	129
S97T002188	223:2	Drainable liquid	130	122	126
S97T002199	223:3	Drainable liquid	136	135	136
S97T002200	223:4	Drainable liquid	139	135	137
S97T002215	223:5	Drainable liquid	135	132	134
S97T002323	224:1	Drainable liquid	135	136	136
S97T002371	224:3	Drainable liquid	128	131	130
S97T002372	224:5	Drainable liquid	111	110	111

Table B2-20. Tank 241-SX-106 Analytical Results: Cobalt (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S98T000695	223:6	Whole	<8.03	<7.52	<7.78
S98T000705	223:6A	Whole	<7.5	<7.86	<7.68
S98T000706	223:9	Whole	<7.6	<7.52	<7.56
S98T000721	224:2	Whole	<4.84	<3.51	<4.18
S98T000722	224:4	Whole	<3.89	<3.83	<3.86
S98T000723	224:7	Whole	<7.86	<7.76	<7.81
S98T000724	224:10	Whole	<3.6	<3.53	<3.56
Solids: fusion			µg/g	µg/g	µg/g
S97T002177	223:1	Lower half	<416	<407	<412
S97T002185	223:2	Lower half	<383	<378	<381
S97T002194	223:3	Lower half	<376	<373	<375
S97T002204	223:4	Lower half	<440	<430	<435
S97T002231	223:5	Lower half	<369	<380	<375
S98T000694	223:6	Whole	<386	<378	<382
S98T000703	223:6A	Whole	<370	<377	<374
S97T002233	223:7	Upper half	<420	<401	<411
S97T002232		Lower half	<392	<406	<399
S97T002235	223:8	Upper half	<405	<404	<405
S97T002234		Lower half	<397	<401	<399
S98T000704	223:9	Whole	<404	<408	<406
S97T002265	223:10	Upper half	<394	<393	<394
S97T002263		Lower half	<410	<410	<410
S97T002320	224:1	Lower half	<380	<369	<375
S98T000717	224:2	Whole	<405	<390	<398
S97T002334	224:3	Lower half	<366	<369	<368
S98T000718	224:4	Whole	<403	<398	<401
S97T002360	224:5	Upper half	<400	<407	<404
S97T002359		Lower half	<404	<400	<402
S97T002362	224:6	Upper half	<364	<349	<357
S97T002361		Lower half	<387	<391	<389

Table B2-20. Tank 241-SX-106 Analytical Results: Cobalt (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			µg/g	µg/g	µg/g
S98T000719	224:7	Whole	<387	<400	<394
S97T002364	224:8	Upper half	<404	<401	<403
S97T002363		Lower half	<369	<362	<366
S97T002392	224:9	Upper half	<437	<438	<438
S97T002387		Lower half	<447	<448	<448
S98T000720	224:10	Whole	<393	<390	<392
S97T002402	224:11	Upper half	<402	<401	<402
S97T002397		Lower half	<394	<385	<390
Liquids			µg/mL	µg/mL	µg/mL
S97T002179	223:1	Drainable liquid	<12	<12	<12
S97T002188	223:2	Drainable liquid	<12	<12	<12
S97T002199	223:3	Drainable liquid	<12	<12	<12
S97T002200	223:4	Drainable liquid	<12	<12	<12
S97T002215	223:5	Drainable liquid	<12	<12	<12
S97T002323	224:1	Drainable liquid	<12	<12	<12
S97T002371	224:3	Drainable liquid	<12	<12	<12
S97T002372	224:5	Drainable liquid	<12	<12	<12

Table B2-21. Tank 241-SX-106 Analytical Results: Copper (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S98T000695	223:6	Whole	<4.01	<3.76	<3.88
S98T000705	223:6A	Whole	<3.75	<3.93	<3.84
S98T000706	223:9	Whole	<3.8	<3.76	<3.78
S98T000721	224:2	Whole	<2.42	<1.75	<2.08
S98T000722	224:4	Whole	<1.94	<1.92	<1.93
S98T000723	224:7	Whole	<3.93	<3.88	<3.91
S98T000724	224:10	Whole	<3.6	<3.53	<3.56
Solids: fusion			µg/g	µg/g	µg/g
S97T002177	223:1	Lower half	<208	<204	<206
S97T002185	223:2	Lower half	<192	<189	<191
S97T002194	223:3	Lower half	<188	<187	<188
S97T002204	223:4	Lower half	<220	<215	<218
S97T002231	223:5	Lower half	<184	<190	<187
S98T000694	223:6	Whole	<193	<189	<191
S98T000703	223:6A	Whole	<185	<189	<187
S97T002233	223:7	Upper half	<210	<200	<205
S97T002232		Lower half	<196	<203	<200
S97T002235	223:8	Upper half	<203	<202	<203
S97T002234		Lower half	<198	<201	<200
S98T000704	223:9	Whole	<202	<204	<203
S97T002265	223:10	Upper half	<197	<197	<197
S97T002263		Lower half	<205	<205	<205
S97T002320	224:1	Lower half	<190	<185	<188
S98T000717	224:2	Whole	<202	<195	<199
S97T002334	224:3	Lower half	<183	<185	<184
S98T000718	224:4	Whole	<201	<199	<200
S97T002360	224:5	Upper half	<200	<204	<202
S97T002359		Lower half	<202	<200	<201
S97T002362	224:6	Upper half	<182	<175	<179
S97T002361		Lower half	<193	<196	<195

Table B2-21. Tank 241-SX-106 Analytical Results: Copper (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			μg/g	μg/g	μg/g
S98T000719	224:7	Whole	<193	<200	<197
S97T002364	224:8	Upper half	<202	<201	<202
S97T002363		Lower half	<185	<181	<183
S97T002392	224:9	Upper half	<219	<219	<219
S97T002387		Lower half	<223	<224	<224
S98T000720	224:10	Whole	<196	<195	<196
S97T002402	224:11	Upper half	<201	<201	<201
S97T002397		Lower half	<197	<192	<195
Liquids			μg/mL	μg/mL	μg/mL
S97T002179	223:1	Drainable liquid	<6.01	<6.01	<6.01
S97T002188	223:2	Drainable liquid	<6.01	<6.01	<6.01
S97T002199	223:3	Drainable liquid	<6.01	<6.01	<6.01
S97T002200	223:4	Drainable liquid	<6.01	<6.01	<6.01
S97T002215	223:5	Drainable liquid	<6.01	<6.01	<6.01
S97T002323	224:1	Drainable liquid	<6.01	<6.01	<6.01
S97T002371	224:3	Drainable liquid	<6.01	<6.01	<6.01
S97T002372	224:5	Drainable liquid	<6.01	<6.01	<6.01

Table B2-22. Tank 241-SX-106 Analytical Results: Iron (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			μg/g	μg/g	μg/g
S98T000695	223:6	Whole	355	359	357
S98T000705	223:6A	Whole	554	415	485[QC:e]
S98T000706	223:9	Whole	415	399	407
S98T000721	224:2	Whole	<12.1	<8.76	<10.4
S98T000722	224:4	Whole	12	<9.58	<10.8[QC:e]
S98T000723	224:7	Whole	234	260	247
S98T000724	224:10	Whole	885	839	862
Solids: fusion			μg/g	μg/g	μg/g
S97T002177	223:1	Lower half	<1,040	<1,020	<1,030
S97T002185	223:2	Lower half	<958	<946	<952
S97T002194	223:3	Lower half	<939	<934	<937
S97T002204	223:4	Lower half	<1,100	<1,070	<1,090
S97T002231	223:5	Lower half	<922	<951	<937
S98T000694	223:6	Whole	<965	<946	<956
S98T000703	223:6A	Whole	<926	<943	<935
S97T002233	223:7	Upper half	1,310	1,140	1,230
S97T002232		Lower half	<979	<1,010	<995
S97T002235	223:8	Upper half	<1,010	<1,010	<1,010
S97T002234		Lower half	<992	<1,000	<996
S98T000704	223:9	Whole	<1,010	<1,020	<1,020
S97T002265	223:10	Upper half	<985	<984	<985
S97T002263		Lower half	1,290	1,240	1,270
S97T002320	224:1	Lower half	<950	<923	<937
S98T000717	224:2	Whole	<1,010	<976	<993
S97T002334	224:3	Lower half	<914	<923	<919
S98T000718	224:4	Whole	<1,010	<995	<1,000
S97T002360	224:5	Upper half	<999	<1,020	<1,010
S97T002359		Lower half	<1,010	<999	<1,000
S97T002362	224:6	Upper half	<910	<873	<892
S97T002361		Lower half	<967	<978	<973

Table B2-22. Tank 241-SX-106 Analytical Results: Iron (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			**μg/g**	**μg/g**	**μg/g**
S98T000719	224:7	Whole	<967	<999	<983
S97T002364	224:8	Upper half	1,180	1,510	1,350[QC:e]
S97T002363		Lower half	1,080	971	1,030
S97T002392	224:9	Upper half	<1,090	<1,100	<1,100
S97T002387		Lower half	1,960	1,820	1,890
S98T000720	224:10	Whole	<982	<976	<979
S97T002402	224:11	Upper half	1,840	1,960	1,900
S97T002397		Lower half	3,980	3,910	3,950
Liquids			**μg/mL**	**μg/mL**	**μg/mL**
S97T002179	223:1	Drainable liquid	<30.1	<30.1	<30.1
S97T002188	223:2	Drainable liquid	<30.1	<30.1	<30.1
S97T002199	223:3	Drainable liquid	<30.1	<30.1	<30.1
S97T002200	223:4	Drainable liquid	<30.1	<30.1	<30.1
S97T002215	223:5	Drainable liquid	<30.1	<30.1	<30.1
S97T002323	224:1	Drainable liquid	<30.1	<30.1	<30.1
S97T002371	224:3	Drainable liquid	<30.1	<30.1	<30.1
S97T002372	224:5	Drainable liquid	<30.1	<30.1	<30.1

Table B2-23. Tank 241-SX-106 Analytical Results: Lanthanum (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S98T000695	223:6	Whole	<20.1	<18.8	<19.5
S98T000705	223:6A	Whole	<18.7	<19.6	<19.1
S98T000706	223:9	Whole	<19	<18.8	<18.9
S98T000721	224:2	Whole	<12.1	<8.76	<10.4
S98T000722	224:4	Whole	<9.72	<9.58	<9.65
S98T000723	224:7	Whole	<19.7	<19.4	<19.5
S98T000724	224:10	Whole	<18	<17.7	<17.9
Solids: fusion			µg/g	µg/g	µg/g
S97T002177	223:1	Lower half	<1,040	<1,020	<1,030
S97T002185	223:2	Lower half	<958	<946	<952
S97T002194	223:3	Lower half	<939	<934	<937
S97T002204	223:4	Lower half	<1,100	<1,070	<1,090
S97T002231	223:5	Lower half	<922	<951	<937
S98T000694	223:6	Whole	<965	<946	<956
S98T000703	223:6A	Whole	<926	<943	<935
S97T002233	223:7	Upper half	<1,050	<1,000	<1,030
S97T002232		Lower half	<979	<1,010	<995
S97T002235	223:8	Upper half	<1,010	<1,010	<1,010
S97T002234		Lower half	<992	<1,000	<996
S98T000704	223:9	Whole	<1,010	<1,020	<1,020
S97T002265	223:10	Upper half	<985	<984	<985
S97T002263		Lower half	<1,020	<1,030	<1,030
S97T002320	224:1	Lower half	<950	<923	<937
S98T000717	224:2	Whole	<1,010	<976	<993
S97T002334	224:3	Lower half	<914	<923	<919
S98T000718	224:4	Whole	<1,010	<995	<1,000
S97T002360	224:5	Upper half	<999	<1,020	<1,010
S97T002359		Lower half	<1,010	<999	<1,000
S97T002362	224:6	Upper half	<910	<873	<892
S97T002361		Lower half	<967	<978	<973

Table B2-23. Tank 241-SX-106 Analytical Results: Lanthanum (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			μg/g	μg/g	μg/g
S98T000719	224:7	Whole	<967	<999	<983
S97T002364	224:8	Upper half	<1,010	<1,000	<1,010
S97T002363		Lower half	<923	<905	<914
S97T002392	224:9	Upper half	<1,090	<1,100	<1,100
S97T002387		Lower half	<1,120	<1,120	<1,120
S98T000720	224:10	Whole	<982	<976	<979
S97T002402	224:11	Upper half	<1,010	<1,000	<1,010
S97T002397		Lower half	<984	<962	<973
Liquids			μg/mL	μg/mL	μg/mL
S97T002179	223:1	Drainable liquid	<30.1	<30.1	<30.1
S97T002188	223:2	Drainable liquid	<30.1	<30.1	<30.1
S97T002199	223:3	Drainable liquid	<30.1	<30.1	<30.1
S97T002200	223:4	Drainable liquid	<30.1	<30.1	<30.1
S97T002215	223:5	Drainable liquid	<30.1	<30.1	<30.1
S97T002323	224:1	Drainable liquid	<30.1	<30.1	<30.1
S97T002371	224:3	Drainable liquid	<30.1	<30.1	<30.1
S97T002372	224:5	Drainable liquid	<30.1	<30.1	<30.1

Table B2-24. Tank 241-SX-106 Analytical Results: Lead (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S98T000695	223:6	Whole	<40.1	49	<44.5
S98T000705	223:6A	Whole	59.5	<39.3	<49.4[QC:e]
S98T000706	223:9	Whole	38.5	<37.6	<38
S98T000721	224:2	Whole	<24.2	<17.5	<20.9
S98T000722	224:4	Whole	<19.4	<19.2	<19.3
S98T000723	224:7	Whole	<39.3	<38.8	<39
S98T000724	224:10	Whole	56.2	56.8	56.5
Solids: fusion			µg/g	µg/g	µg/g
S97T002177	223:1	Lower half	<2,080	<2,040	<2,060
S97T002185	223:2	Lower half	<1,920	<1,890	<1,910
S97T002194	223:3	Lower half	<1,880	<1,870	<1,880
S97T002204	223:4	Lower half	<2,200	<2,150	<2,180
S97T002231	223:5	Lower half	<1,840	<1,900	<1,870
S98T000694	223:6	Whole	<1,930	<1,890	<1,910
S98T000703	223:6A	Whole	<1,850	<1,890	<1,870
S97T002233	223:7	Upper half	<2,100	<2,000	<2,050
S97T002232		Lower half	<1,960	<2,030	<2,000
S97T002235	223:8	Upper half	<2,030	<2,020	<2,030
S97T002234		Lower half	<1,980	<2,010	<2,000
S98T000704	223:9	Whole	<2,020	<2,040	<2,030
S97T002265	223:10	Upper half	<1,970	<1,970	<1,970
S97T002263		Lower half	<2,050	<2,050	<2,050
S97T002320	224:1	Lower half	<1,900	<1,850	<1,880
S98T000717	224:2	Whole	<2,020	<1,950	<1,990
S97T002334	224:3	Lower half	<1,830	<1,850	<1,840
S98T000718	224:4	Whole	<2,010	<1,990	<2,000
S97T002360	224:5	Upper half	<2,000	<2,040	<2,020
S97T002359		Lower half	<2,020	<2,000	<2,010
S97T002362	224:6	Upper half	<1,820	<1,750	<1,790
S97T002361		Lower half	<1,930	<1,960	<1,950

Table B2-24. Tank 241-SX-106 Analytical Results: Lead (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			**µg/g**	**µg/g**	**µg/g**
S98T000719	224:7	Whole	<1,930	<2,000	<1,970
S97T002364	224:8	Upper half	<2,020	<2,010	<2,020
S97T002363		Lower half	<1,850	<1,810	<1,830
S97T002392	224:9	Upper half	<2,190	<2,190	<2,190
S97T002387		Lower half	<2,230	<2,240	<2,240
S98T000720	224:10	Whole	<1,960	<1,950	<1,960
S97T002402	224:11	Upper half	<2,010	<2,010	<2,010
S97T002397		Lower half	<1,970	<1,920	<1,950
Liquids			**µg/mL**	**µg/mL**	**µg/mL**
S97T002179	223:1	Drainable liquid	<60.1	<60.1	<60.1
S97T002188	223:2	Drainable liquid	<60.1	<60.1	<60.1
S97T002199	223:3	Drainable liquid	<60.1	<60.1	<60.1
S97T002200	223:4	Drainable liquid	<60.1	<60.1	<60.1
S97T002215	223:5	Drainable liquid	<60.1	<60.1	<60.1
S97T002323	224:1	Drainable liquid	<60.1	<60.1	<60.1
S97T002371	224:3	Drainable liquid	<60.1	<60.1	<60.1
S97T002372	224:5	Drainable liquid	<60.1	<60.1	<60.1

Table B2-25. Tank 241-SX-106 Analytical Results: Lithium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S98T000695	223:6	Whole	<4.01	<3.76	<3.88
S98T000705	223:6A	Whole	41.9	<3.93	<22.9[QC:e]
S98T000706	223:9	Whole	<3.8	<3.76	<3.78
S98T000721	224:2	Whole	<2.42	<1.75	<2.08
S98T000722	224:4	Whole	<1.94	<1.92	<1.93
S98T000723	224:7	Whole	<3.93	<3.88	<3.91
S98T000724	224:10	Whole	5.33	5.31	5.32
Solids: fusion			µg/g	µg/g	µg/g
S97T002177	223:1	Lower half	<208	<204	<206
S97T002185	223:2	Lower half	<192	<189	<191
S97T002194	223:3	Lower half	<188	<187	<188
S97T002204	223:4	Lower half	<220	<215	<218
S97T002231	223:5	Lower half	<184	<190	<187
S98T000694	223:6	Whole	<193	<189	<191
S98T000703	223:6A	Whole	<185	<189	<187
S97T002233	223:7	Upper half	<210	<200	<205
S97T002232		Lower half	<196	<203	<200
S97T002235	223:8	Upper half	<203	<202	<203
S97T002234		Lower half	<198	<201	<200
S98T000704	223:9	Whole	<202	<204	<203
S97T002265	223:10	Upper half	<197	<197	<197
S97T002263		Lower half	<205	<205	<205
S97T002320	224:1	Lower half	<190	<185	<188
S98T000717	224:2	Whole	<202	<195	<199
S97T002334	224:3	Lower half	<183	<185	<184
S98T000718	224:4	Whole	<201	<199	<200
S97T002360	224:5	Upper half	<200	<204	<202
S97T002359		Lower half	<202	<200	<201
S97T002362	224:6	Upper half	<182	<175	<179
S97T002361		Lower half	<193	<196	<195

Table B2-25. Tank 241-SX-106 Analytical Results: Lithium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			µg/g	µg/g	µg/g
S98T000719	224:7	Whole	<193	<200	<197
S97T002364	224:8	Upper half	<202	<201	<202
S97T002363		Lower half	<185	<181	<183
S97T002392	224:9	Upper half	<219	<219	<219
S97T002387		Lower half	<223	<224	<224
S98T000720	224:10	Whole	<196	<195	<196
S97T002402	224:11	Upper half	<201	<201	<201
S97T002397		Lower half	<197	<192	<195
Liquids			µg/mL	µg/mL	µg/mL
S97T002179	223:1	Drainable liquid	<6.01	<6.01	<6.01
S97T002188	223:2	Drainable liquid	<6.01	<6.01	<6.01
S97T002199	223:3	Drainable liquid	<6.01	<6.01	<6.01
S97T002200	223:4	Drainable liquid	10.6	9.74	10.2
S97T002215	223:5	Drainable liquid	<6.01	<6.01	<6.01
S97T002323	224:1	Drainable liquid	9.7	9.26	9.48
S97T002371	224:3	Drainable liquid	7.56	8.06	7.81
S97T002372	224:5	Drainable liquid	11.1	11.1	11.1

Table B2-26. Tank 241-SX-106 Analytical Results: Magnesium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S98T000695	223:6	Whole	<40.1	<37.6	<38.9
S98T000705	223:6A	Whole	<37.5	<39.3	<38.4
S98T000706	223:9	Whole	<38	<37.6	<37.8
S98T000721	224:2	Whole	<24.2	<17.5	<20.9
S98T000722	224:4	Whole	<19.4	<19.2	<19.3
S98T000723	224:7	Whole	<39.3	<38.8	<39
S98T000724	224:10	Whole	<36	<35.3	<35.6
Solids: fusion			µg/g	µg/g	µg/g
S97T002177	223:1	Lower half	<2,080	<2,040	<2,060
S97T002185	223:2	Lower half	<1,920	<1,890	<1,910
S97T002194	223:3	Lower half	<1,880	<1,870	<1,880
S97T002204	223:4	Lower half	<2,200	<2,150	<2,180
S97T002231	223:5	Lower half	<1,840	<1,900	<1,870
S98T000694	223:6	Whole	<1,930	<1,890	<1,910
S98T000703	223:6A	Whole	<1,850	<1,890	<1,870
S97T002233	223:7	Upper half	<2,100	<2,000	<2,050
S97T002232		Lower half	<1,960	<2,030	<2,000
S97T002235	223:8	Upper half	<2,030	<2,020	<2,030
S97T002234		Lower half	<1,980	<2,010	<2,000
S98T000704	223:9	Whole	<2,020	<2,040	<2,030
S97T002265	223:10	Upper half	<1,970	<1,970	<1,970
S97T002263		Lower half	<2,050	<2,050	<2,050
S97T002320	224:1	Lower half	<1,900	<1,850	<1,880
S98T000717	224:2	Whole	<2,020	<1,950	<1,990
S97T002334	224:3	Lower half	<1,830	<1,850	<1,840
S98T000718	224:4	Whole	<2,010	<1,990	<2,000
S97T002360	224:5	Upper half	<2,000	<2,040	<2,020
S97T002359		Lower half	<2,020	<2,000	<2,010
S97T002362	224:6	Upper half	<1,820	<1,750	<1,790
S97T002361		Lower half	<1,930	<1,960	<1,950

Table B2-26. Tank 241-SX-106 Analytical Results: Magnesium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			**μg/g**	**μg/g**	**μg/g**
S98T000719	224:7	Whole	<1,930	<2,000	<1,970
S97T002364	224:8	Upper half	<2,020	<2,010	<2,020
S97T002363		Lower half	<1,850	<1,810	<1,830
S97T002392	224:9	Upper half	<2,190	<2,190	<2,190
S97T002387		Lower half	<2,230	<2,240	<2,240
S98T000720	224:10	Whole	<1,960	<1,950	<1,960
S97T002402	224:11	Upper half	<2,010	<2,010	<2,010
S97T002397		Lower half	<1,970	<1,920	<1,950
Liquids			**μg/mL**	**μg/mL**	**μg/mL**
S97T002179	223:1	Drainable liquid	<60.1	<60.1	<60.1
S97T002188	223:2	Drainable liquid	<60.1	<60.1	<60.1
S97T002199	223:3	Drainable liquid	<60.1	<60.1	<60.1
S97T002200	223:4	Drainable liquid	<60.1	<60.1	<60.1
S97T002215	223:5	Drainable liquid	<60.1	<60.1	<60.1
S97T002323	224:1	Drainable liquid	<60.1	<60.1	<60.1
S97T002371	224:3	Drainable liquid	<60.1	<60.1	<60.1
S97T002372	224:5	Drainable liquid	<60.1	<60.1	<60.1

Table B2-27. Tank 241-SX-106 Analytical Results: Manganese (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S98T000695	223:6	Whole	110	111	111
S98T000705	223:6A	Whole	161	128	145[QC:e]
S98T000706	223:9	Whole	128	123	126
S98T000721	224:2	Whole	<2.42	<1.75	<2.08
S98T000722	224:4	Whole	<1.94	<1.92	<1.93
S98T000723	224:7	Whole	67	73.9	70.5
S98T000724	224:10	Whole	211	200	206
Solids: fusion			µg/g	µg/g	µg/g
S97T002177	223:1	Lower half	<208	<204	<206
S97T002185	223:2	Lower half	<192	<189	<191
S97T002194	223:3	Lower half	<188	<187	<188
S97T002204	223:4	Lower half	<220	<215	<218
S97T002231	223:5	Lower half	<184	<190	<187
S98T000694	223:6	Whole	<193	<189	<191
S98T000703	223:6A	Whole	<185	<189	<187
S97T002233	223:7	Upper half	416	401	409
S97T002232		Lower half	324	345	335
S97T002235	223:8	Upper half	<203	<202	<203
S97T002234		Lower half	<198	<201	<200
S98T000704	223:9	Whole	<202	<204	<203
S97T002265	223:10	Upper half	237	270	254
S97T002263		Lower half	433	426	430
S97T002320	224:1	Lower half	<190	<185	<188
S98T000717	224:2	Whole	<202	<195	<199
S97T002334	224:3	Lower half	<183	<185	<184
S98T000718	224:4	Whole	<201	<199	<200
S97T002360	224:5	Upper half	<200	<204	<202
S97T002359		Lower half	244	268	256
S97T002362	224:6	Upper half	283	305	294
S97T002361		Lower half	291	312	302

Table B2-27. Tank 241-SX-106 Analytical Results: Manganese (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			**μg/g**	**μg/g**	**μg/g**
S98T000719	224:7	Whole	<193	<200	<197
S97T002364	224:8	Upper half	363	459	411[QC:e]
S97T002363		Lower half	348	308	328
S97T002392	224:9	Upper half	258	247	253
S97T002387		Lower half	608	590	599
S98T000720	224:10	Whole	301	246	274[QC:e]
S97T002402	224:11	Upper half	654	673	664
S97T002397		Lower half	1970	2080	2030
Liquids			**μg/mL**	**μg/mL**	**μg/mL**
S97T002179	223:1	Drainable liquid	<6.01	<6.01	<6.01
S97T002188	223:2	Drainable liquid	<6.01	<6.01	<6.01
S97T002199	223:3	Drainable liquid	<6.01	<6.01	<6.01
S97T002200	223:4	Drainable liquid	<6.01	<6.01	<6.01
S97T002215	223:5	Drainable liquid	<6.01	<6.01	<6.01
S97T002323	224:1	Drainable liquid	<6.01	<6.01	<6.01
S97T002371	224:3	Drainable liquid	<6.01	<6.01	<6.01
S97T002372	224:5	Drainable liquid	<6.01	<6.01	<6.01

Table B2-28. Tank 241-SX-106 Analytical Results: Molybdenum (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S98T000695	223:6	Whole	40.8	41.1	41
S98T000705	223:6A	Whole	38.9	28.4	33.6[QC:e]
S98T000706	223:9	Whole	27.7	27.6	27.6
S98T000721	224:2	Whole	39.6	40.7	40.2
S98T000722	224:4	Whole	41.3	42	41.6
S98T000723	224:7	Whole	33.4	34	33.7
S98T000724	224:10	Whole	34.7	34.9	34.8
Solids: fusion			µg/g	µg/g	µg/g
S97T002177	223:1	Lower half	<1,040	<1,020	<1,030
S97T002185	223:2	Lower half	<958	<946	<952
S97T002194	223:3	Lower half	<939	<934	<937
S97T002204	223:4	Lower half	<1,100	<1,070	<1,090
S97T002231	223:5	Lower half	<922	<951	<937
S98T000694	223:6	Whole	<965	<946	<956
S98T000703	223:6A	Whole	<926	<943	<935
S97T002233	223:7	Upper half	<1,050	<1,000	<1,030
S97T002232		Lower half	<979	<1,010	<995
S97T002235	223:8	Upper half	<1,010	<1,010	<1,010
S97T002234		Lower half	<992	<1,000	<996
S98T000704	223:9	Whole	<1,010	<1,020	<1,020
S97T002265	223:10	Upper half	<985	<984	<985
S97T002263		Lower half	<1,020	<1,030	<1,030
S97T002320	224:1	Lower half	<950	<923	<937
S98T000717	224:2	Whole	<1,010	<976	<993
S97T002334	224:3	Lower half	<914	<923	<919
S98T000718	224:4	Whole	<1,010	<995	<1,000
S97T002360	224:5	Upper half	<999	<1,020	<1,010
S97T002359		Lower half	<1,010	<999	<1,000
S97T002362	224:6	Upper half	<910	<873	<892
S97T002361		Lower half	<967	<978	<973

Table B2-28. Tank 241-SX-106 Analytical Results: Molybdenum (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			µg/g	µg/g	µg/g
S98T000719	224:7	Whole	<967	<999	<983
S97T002364	224:8	Upper half	<1,010	<1,000	<1,010
S97T002363		Lower half	<923	<905	<914
S97T002392	224:9	Upper half	<1,090	<1,100	<1,100
S97T002387		Lower half	<1,120	<1,120	<1,120
S98T000720	224:10	Whole	<982	<976	<979
S97T002402	224:11	Upper half	<1,010	<1,000	<1,010
S97T002397		Lower half	<984	<962	<973
Liquids			µg/mL	µg/mL	µg/mL
S97T002179	223:1	Drainable liquid	125	121	123
S97T002188	223:2	Drainable liquid	126	117	122
S97T002199	223:3	Drainable liquid	131	130	131
S97T002200	223:4	Drainable liquid	132	128	130
S97T002215	223:5	Drainable liquid	132	130	131
S97T002323	224:1	Drainable liquid	130	132	131
S97T002371	224:3	Drainable liquid	127	128	128
S97T002372	224:5	Drainable liquid	119	120	120

Table B2-29. Tank 241-SX-106 Analytical Results: Neodymium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S98T000695	223:6	Whole	<40.1	<37.6	<38.9
S98T000705	223:6A	Whole	<37.5	<39.3	<38.4
S98T000706	223:9	Whole	<38	<37.6	<37.8
S98T000721	224:2	Whole	<24.2	<17.5	<20.9
S98T000722	224:4	Whole	<19.4	<19.2	<19.3
S98T000723	224:7	Whole	<39.3	<38.8	<39
S98T000724	224:10	Whole	<36	<35.3	<35.6
Solids: fusion			µg/g	µg/g	µg/g
S97T002177	223:1	Lower half	<2,080	<2,040	<2,060
S97T002185	223:2	Lower half	<1,920	<1,890	<1,910
S97T002194	223:3	Lower half	<1,880	<1,870	<1,880
S97T002204	223:4	Lower half	<2,200	<2,150	<2,180
S97T002231	223:5	Lower half	<1,840	<1,900	<1,870
S98T000694	223:6	Whole	<1,930	<1,890	<1,910
S98T000703	223:6A	Whole	<1,850	<1,890	<1,870
S97T002233	223:7	Upper half	<2,100	<2,000	<2,050
S97T002232		Lower half	<1,960	<2,030	<2,000
S97T002235	223:8	Upper half	<2,030	<2,020	<2,030
S97T002234		Lower half	<1,980	<2,010	<2,000
S98T000704	223:9	Whole	<2,020	<2,040	<2,030
S97T002265	223:10	Upper half	<1,970	<1,970	<1,970
S97T002263		Lower half	<2,050	<2,050	<2,050
S97T002320	224:1	Lower half	<1,900	<1,850	<1,880
S98T000717	224:2	Whole	<2,020	<1,950	<1,990
S97T002334	224:3	Lower half	<1,830	<1,850	<1,840
S98T000718	224:4	Whole	<2,010	<1,990	<2,000
S97T002360	224:5	Upper half	<2,000	<2,040	<2,020
S97T002359		Lower half	<2,020	<2,000	<2,010
S97T002362	224:6	Upper half	<1,820	<1,750	<1,790
S97T002361		Lower half	<1,930	<1,960	<1,950

Table B2-29. Tank 241-SX-106 Analytical Results: Neodymium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			μg/g	μg/g	μg/g
S98T000719	224:7	Whole	<1,930	<2,000	<1,970
S97T002364	224:8	Upper half	<2,020	<2,010	<2,020
S97T002363		Lower half	<1,850	<1,810	<1,830
S97T002392	224:9	Upper half	<2,190	<2,190	<2,190
S97T002387		Lower half	<2,230	<2,240	<2,240
S98T000720	224:10	Whole	<1,960	<1,950	<1,960
S97T002402	224:11	Upper half	<2,010	<2,010	<2,010
S97T002397		Lower half	<1,970	<1,920	<1,950
Liquids			μg/mL	μg/mL	μg/mL
S97T002179	223:1	Drainable liquid	<60.1	<60.1	<60.1
S97T002188	223:2	Drainable liquid	<60.1	<60.1	<60.1
S97T002199	223:3	Drainable liquid	<60.1	<60.1	<60.1
S97T002200	223:4	Drainable liquid	<60.1	<60.1	<60.1
S97T002215	223:5	Drainable liquid	<60.1	<60.1	<60.1
S97T002323	224:1	Drainable liquid	<60.1	<60.1	<60.1
S97T002371	224:3	Drainable liquid	<60.1	<60.1	<60.1
S97T002372	224:5	Drainable liquid	<60.1	<60.1	<60.1

Table B2-30. Tank 241-SX-106 Analytical Results: Nickel (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			μg/g	μg/g	μg/g
S98T000695	223:6	Whole	24.1	25.6	24.9
S98T000705	223:6A	Whole	54.4	28.8	41.6[QC:e]
S98T000706	223:9	Whole	28.6	25.7	27.1
S98T000721	224:2	Whole	<4.84	<3.51	<4.17
S98T000722	224:4	Whole	<3.89	<3.83	<3.86
S98T000723	224:7	Whole	15.5	22.3	18.9[QC:e]
S98T000724	224:10	Whole	19.6	19.3	19.5
Liquids			μg/mL	μg/mL	μg/mL
S97T002179	223:1	Drainable liquid	<12	<12	<12
S97T002188	223:2	Drainable liquid	<12	<12	<12
S97T002199	223:3	Drainable liquid	<12	<12	<12
S97T002200	223:4	Drainable liquid	<12	<12	<12
S97T002215	223:5	Drainable liquid	<12	<12	<12
S97T002323	224:1	Drainable liquid	<12	<12	<12
S97T002371	224:3	Drainable liquid	<12	<12	<12
S97T002372	224:5	Drainable liquid	<12	<12	<12

Table B2-31. Tank 241-SX-106 Analytical Results: Phosphorus (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S98T000695	223:6	Whole	1,210	1,250	1,230
S98T000705	223:6A	Whole	1,220	691	956[QC:e]
S98T000706	223:9	Whole	696	670	683
S98T000721	224:2	Whole	722	727	725
S98T000722	224:4	Whole	704	708	706
S98T000723	224:7	Whole	1,060	1,090	1,080
S98T000724	224:10	Whole	742	737	740
Solids: fusion			µg/g	µg/g	µg/g
S97T002177	223:1	Lower half	<4,160	<4,070	<4,120
S97T002185	223:2	Lower half	10,100	6,440	8,270[QC:e]
S97T002194	223:3	Lower half	4,080	<3,730	<3,910[QC:d]
S97T002204	223:4	Lower half	11,400	5,450	8,430[QC:d,e]
S97T002231	223:5	Lower half	<3,690	<3,800	<3,750[QC:d]
S98T000694	223:6	Whole	<3,860	<3,780	<3,820
S98T000703	223:6A	Whole	<3,700	<3,770	<3,740
S97T002233	223:7	Upper half	<4,200	4,850	<4,530
S97T002232		Lower half	<3,920	<4,060	<3,990
S97T002235	223:8	Upper half	<4,050	<4,040	<4,050
S97T002234		Lower half	<3,970	<4,010	<3,990
S98T000704	223:9	Whole	<4,040	<4,080	<4,060
S97T002265	223:10	Upper half	<3,940	<3,930	<3,940
S97T002263		Lower half	<4,100	<4,100	<4,100
S97T002320	224:1	Lower half	<3,800	<3,690	<3,750
S98T000717	224:2	Whole	<4,050	<3,900	<3,980
S97T002334	224:3	Lower half	<3,660	<3,690	<3,680
S98T000718	224:4	Whole	<4,030	<3,980	<4,010
S97T002360	224:5	Upper half	<4,000	<4,070	<4,040
S97T002359		Lower half	<4,040	<4,000	<4,020
S97T002362	224:6	Upper half	3,660	4,150	3,910
S97T002361		Lower half	<3,870	<3,910	<3,890

Table B2-31. Tank 241-SX-106 Analytical Results: Phosphorus (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			**µg/g**	**µg/g**	**µg/g**
S98T000719	224:7	Whole	<3,870	<4,000	<3,940
S97T002364	224:8	Upper half	<4,040	<4,010	<4,030
S97T002363		Lower half	<3,690	<3,620	<3,660
S97T002392	224:9	Upper half	<4,370	<4,380	<4,380
S97T002387		Lower half	6,100	6,030	6,070
S98T000720	224:10	Whole	<3,930	<3,900	<3,920
S97T002402	224:11	Upper half	10,700	10,500	10,600
S97T002397		Lower half	10,100	12,400	11,300[QC:e]
Liquids			**µg/mL**	**µg/mL**	**µg/mL**
S97T002179	223:1	Drainable liquid	1,140	1,110	1,130
S97T002188	223:2	Drainable liquid	1,110	1,060	1,090
S97T002199	223:3	Drainable liquid	1,040	1,040	1,040[QC:c]
S97T002200	223:4	Drainable liquid	1,170	1,130	1,150
S97T002215	223:5	Drainable liquid	1,340	1,630	1,490
S97T002323	224:1	Drainable liquid	1,200	1,210	1,210
S97T002371	224:3	Drainable liquid	1,040	1,060	1,050
S97T002372	224:5	Drainable liquid	1,020	1,040	1,030

Table B2-32. Tank 241-SX-106 Analytical Results: Potassium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			**µg/g**	**µg/g**	**µg/g**
S98T000695	223:6	Whole	1,140	1,180	1,160
S98T000705	223:6A	Whole	1,110	880	9,95[QC:e]
S98T000706	223:9	Whole	879	807	843
S98T000721	224:2	Whole	1,290	1,250	1,270
S98T000722	224:4	Whole	1,300	1,350	1,330
S98T000723	224:7	Whole	1,100	1,090	1,100
S98T000724	224:10	Whole	1,060	1,180	1,120
Liquids			**µg/mL**	**µg/mL**	**µg/mL**
S97T002179	223:1	Drainable liquid	3,850	3,670	3,760
S97T002188	223:2	Drainable liquid	3,960	3,670	3,820
S97T002199	223:3	Drainable liquid	4,020	3,940	3,980[QC:c]
S97T002200	223:4	Drainable liquid	4,020	3,760	3,890[QC:c]
S97T002215	223:5	Drainable liquid	4,030	3,960	4,000
S97T002323	224:1	Drainable liquid	4,100	4,310	4,210
S97T002371	224:3	Drainable liquid	3,790	3,860	3,830
S97T002372	224:5	Drainable liquid	3,660	3,660	3,660

Table B2-33. Tank 241-SX-106 Analytical Results: Samarium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S98T000695	223:6	Whole	<40.1	<37.6	<38.9
S98T000705	223:6A	Whole	<37.5	<39.3	<38.4
S98T000706	223:9	Whole	<38	<37.6	<37.8
S98T000721	224:2	Whole	<24.2	<17.5	<20.9
S98T000722	224:4	Whole	<19.4	<19.2	<19.3
S98T000723	224:7	Whole	<39.3	<38.8	<39
S98T000724	224:10	Whole	<36	<35.3	<35.6
Solids: fusion			µg/g	µg/g	µg/g
S97T002177	223: 1	Lower half	<2,080	<2,040	<2,060
S97T002185	223: 2	Lower half	<1,920	<1,890	<1,910
S97T002194	223: 3	Lower half	<1,880	<1,870	<1,880
S97T002204	223: 4	Lower half	<2,200	<2,150	<2,180
S97T002231	223: 5	Lower half	<1,840	<1,900	<1,870
S98T000694	223: 6	Whole	<1,930	<1,890	<1,910
S98T000703	223: 6A	Whole	<1,850	<1,890	<1,870
S97T002233	223: 7	Upper half	<2,100	<2,000	<2,050
S97T002232		Lower half	<1,960	<2,030	<2,000
S97T002235	223: 8	Upper half	<2,030	<2,020	<2,030
S97T002234		Lower half	<1,980	<2,010	<2,000
S98T000704	223: 9	Whole	<2,020	<2,040	<2,030
S97T002265	223:10	Upper half	<1,970	<1,970	<1,970
S97T002263		Lower half	<2,050	<2,050	<2,050
S97T002320	224: 1	Lower half	<1,900	<1,850	<1,880
S98T000717	224: 2	Whole	<2,020	<1,950	<1,990
S97T002334	224: 3	Lower half	<1,830	<1,850	<1,840
S98T000718	224: 4	Whole	<2,010	<1,990	<2,000
S97T002360	224: 5	Upper half	<2,000	<2,040	<2,020
S97T002359		Lower half	<2,020	<2,000	<2,010
S97T002362	224: 6	Upper half	<1,820	<1,750	<1,790
S97T002361		Lower half	<1,930	<1,960	<1,950

Table B2-33. Tank 241-SX-106 Analytical Results: Samarium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			µg/g	µg/g	µg/g
S98T000719	224: 7	Whole	<1,930	<2,000	<1,970
S97T002364	224: 8	Upper half	<2,020	<2,010	<2,020
S97T002363		Lower half	<1,850	<1,810	<1,830
S97T002392	224: 9	Upper half	<2,190	<2,190	<2,190
S97T002387		Lower half	<2,230	<2,240	<2,240
S98T000720	224:10	Whole	<1,960	<1,950	<1,960
S97T002402	224:11	Upper half	<2,010	<2,010	<2,010
S97T002397		Lower half	<1,970	<1,920	<1,950
Liquids			µg/mL	µg/mL	µg/mL
S97T002179	223: 1	Drainable liquid	<60.1	<60.1	<60.1
S97T002188	223: 2	Drainable liquid	<60.1	<60.1	<60.1
S97T002199	223: 3	Drainable liquid	<60.1	<60.1	<60.1
S97T002200	223: 4	Drainable liquid	<60.1	<60.1	<60.1
S97T002215	223: 5	Drainable liquid	<60.1	<60.1	<60.1
S97T002323	224: 1	Drainable liquid	<60.1	<60.1	<60.1
S97T002371	224: 3	Drainable liquid	<60.1	<60.1	<60.1
S97T002372	224: 5	Drainable liquid	<60.1	<60.1	<60.1

Table B2-34. Tank 241-SX-106 Analytical Results: Selenium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S98T000695	223: 6	Whole	<40.1	<37.6	<38.9
S98T000705	223: 6A	Whole	<37.5	<39.3	<38.4
S98T000706	223: 9	Whole	<38	<37.6	<37.8
S98T000721	224: 2	Whole	<24.2	<17.5	<20.9
S98T000722	224: 4	Whole	<19.4	<19.2	<19.3
S98T000723	224: 7	Whole	<39.3	<38.8	<39
S98T000724	224:10	Whole	<36	<35.3	<35.6
Solids: fusion			µg/g	µg/g	µg/g
S97T002177	223:1	Lower half	<2,080	<2,040	<2,060
S97T002185	223:2	Lower half	<1,920	<1,890	<1,910
S97T002194	223:3	Lower half	<1,880	<1,870	<1,880
S97T002204	223:4	Lower half	<2,200	<2,150	<2,180
S97T002231	223:5	Lower half	<1,840	<1,900	<1,870
S98T000694	223:6	Whole	<1,930	<1,890	<1,910
S98T000703	223:6A	Whole	<1,850	<1,890	<1,870
S97T002233	223:7	Upper half	<2,100	<2,000	<2,050
S97T002232		Lower half	<1,960	<2,030	<2,000
S97T002235	223:8	Upper half	<2,030	<2,020	<2,030
S97T002234		Lower half	<1,980	<2,010	<2,000
S98T000704	223:9	Whole	<2,020	<2,040	<2,030
S97T002265	223:10	Upper half	<1,970	<1,970	<1,970
S97T002263		Lower half	<2,050	<2,050	<2,050
S97T002320	224:1	Lower half	<1,900	<1,850	<1,880
S98T000717	224:2	Whole	<2,020	<1,950	<1,990
S97T002334	224:3	Lower half	<1,830	<1,850	<1,840
S98T000718	224:4	Whole	<2,010	<1,990	<2,000
S97T002360	224:5	Upper half	<2,000	<2,040	<2,020
S97T002359		Lower half	<2,020	<2,000	<2,010
S97T002362	224:6	Upper half	<1,820	<1,750	<1,790
S97T002361		Lower half	<1,930	<1,960	<1,950

Table B2-34. Tank 241-SX-106 Analytical Results: Selenium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			μg/g	μg/g	μg/g
S98T000719	224:7	Whole	<1,930	<2,000	<1,970
S97T002364	224:8	Upper half	<2,020	<2,010	<2,020
S97T002363		Lower half	<1,850	<1,810	<1,830
S97T002392	224:9	Upper half	<2,190	<2,190	<2,190
S97T002387		Lower half	<2,230	<2,240	<2,240
S98T000720	224:10	Whole	<1,960	<1,950	<1,960
S97T002402	224:11	Upper half	<2,010	<2,010	<2,010
S97T002397		Lower half	<1,970	<1,920	<1,950
Liquids			μg/mL	μg/mL	μg/mL
S97T002179	223:1	Drainable liquid	<60.1	<60.1	<60.1
S97T002188	223:2	Drainable liquid	<60.1	<60.1	<60.1
S97T002199	223:3	Drainable liquid	<60.1	<60.1	<60.1
S97T002200	223:4	Drainable liquid	<60.1	<60.1	<60.1
S97T002215	223:5	Drainable liquid	<60.1	<60.1	<60.1
S97T002323	224:1	Drainable liquid	<60.1	<60.1	<60.1
S97T002371	224:3	Drainable liquid	<60.1	<60.1	<60.1
S97T002372	224:5	Drainable liquid	<60.1	<60.1	<60.1

Table B2-35. Tank 241-SX-106 Analytical Results: Silicon (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S98T000695	223:6	Whole	218	204	211[QC:b]
S98T000705	223:6A	Whole	201	289	245[QC:b,e]
S98T000706	223:9	Whole	294	278	286[QC:b]
S98T000721	224:2	Whole	148	132	140[QC:b]
S98T000722	224:4	Whole	141	96.7	119[QC:b,e]
S98T000723	224:7	Whole	177	201	189
S98T000724	224:10	Whole	213	213	213
Solids: fusion			µg/g	µg/g	µg/g
S97T002177	223:1	Lower half	<1,040	<1,020	<1,030
S97T002185	223:2	Lower half	<958	<946	<952
S97T002194	223:3	Lower half	<939	<934	<937
S97T002204	223:4	Lower half	<1,100	<1,070	<1,090
S97T002231	223:5	Lower half	994	<951	<973
S98T000694	223:6	Whole	<965	<946	<956
S98T000703	223:6A	Whole	<926	<943	<935
S97T002233	223:7	Upper half	2,250	1,750	2,000[QC:e]
S97T002232		Lower half	1,050	1,820	1,440[QC:e]
S97T002235	223:8	Upper half	<1,010	<1,010	<1,010
S97T002234		Lower half	<992	<1,000	<996
S98T000704	223:9	Whole	<1,010	<1,020	<1,020
S97T002265	223:10	Upper half	<985	<984	<985
S97T002263		Lower half	<1,020	<1,030	<1,030
S97T002320	224:1	Lower half	<950	<923	<937
S98T000717	224:2	Whole	<1,010	<976	<993
S97T002334	224:3	Lower half	<914	<923	<919
S98T000718	224:4	Whole	<1,010	<995	<1,000
S97T002360	224:5	Upper half	<999	<1,020	<1,010
S97T002359		Lower half	<1,010	<999	<1,000
S97T002362	224:6	Upper half	<910	<873	<892
S97T002361		Lower half	<967	<978	<973

Table B2-35. Tank 241-SX-106 Analytical Results: Silicon (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			µg/g	µg/g	µg/g
S98T000719	224:7	Whole	<967	<999	<983
S97T002364	224:8	Upper half	<1,010	<1,000	<1,010
S97T002363		Lower half	<923	<905	<914
S97T002392	224:9	Upper half	<1,090	<1,100	<1,100
S97T002387		Lower half	1,150	<1,120	<1,140
S98T000720	224:10	Whole	<982	<976	<979
S97T002402	224:11	Upper half	<1,010	<1,000	<1,010
S97T002397		Lower half	<984	1,000	<992
Liquids			µg/mL	µg/mL	µg/mL
S97T002179	223:1	Drainable liquid	64.8	63.4	64.1
S97T002188	223:2	Drainable liquid	57.3	55.6	56.5
S97T002199	223:3	Drainable liquid	58.6	56.2	57.4
S97T002200	223:4	Drainable liquid	74.6	66.7	70.7
S97T002215	223:5	Drainable liquid	49.2	50.4	49.8
S97T002323	224:1	Drainable liquid	181	175	178
S97T002371	224:3	Drainable liquid	97.9	96.3	97.1
S97T002372	224:5	Drainable liquid	68.9	67.8	68.3

Table B2-36. Tank 241-SX-106 Analytical Results: Silver (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			μg/g	μg/g	μg/g
S98T000695	223:6	Whole	8.11	8.57	8.34
S98T000705	223:6A	Whole	8.26	7.91	8.09
S98T000706	223:9	Whole	8.4	8.2	8.3
S98T000721	224:2	Whole	6.31	6.36	6.34
S98T000722	224:4	Whole	7.29	7.07	7.18
S98T000723	224:7	Whole	7.97	8.35	8.16
S98T000724	224:10	Whole	10.2	10.5	10.3
Solids: fusion			μg/g	μg/g	μg/g
S97T002177	223:1	Lower half	<208	<204	<206
S97T002185	223:2	Lower half	<192	<189	<191
S97T002194	223:3	Lower half	<188	<187	<188[QC:c]
S97T002204	223:4	Lower half	<220	<215	<218[QC:c]
S97T002231	223:5	Lower half	<184	<190	<187[QC:c]
S98T000694	223:6	Whole	<193	<189	<191
S98T000703	223:6A	Whole	<185	<189	<187
S97T002233	223:7	Upper half	<210	<200	<205
S97T002232		Lower half	<196	<203	<200
S97T002235	223:8	Upper half	<203	<202	<203
S97T002234		Lower half	<198	<201	<200
S98T000704	223:9	Whole	<202	<204	<203
S97T002265	223:10	Upper half	<197	<197	<197
S97T002263		Lower half	<205	<205	<205
S97T002320	224:1	Lower half	<190	<185	<188[QC:c]
S98T000717	224:2	Whole	<202	<195	<199
S97T002334	224:3	Lower half	<183	<185	<184
S98T000718	224:4	Whole	<201	<199	<200
S97T002360	224:5	Upper half	<200	<204	<202
S97T002359		Lower half	<202	<200	<201[QC:c]
S97T002362	224:6	Upper half	<182	<175	<179
S97T002361		Lower half	<193	<196	<195

Table B2-36. Tank 241-SX-106 Analytical Results: Silver (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			**μg/g**	**μg/g**	**μg/g**
S98T000719	224:7	Whole	<193	<200	<197
S97T002364	224:8	Upper half	<202	<201	<202
S97T002363		Lower half	<185	<181	<183
S97T002392	224:9	Upper half	<219	<219	<219
S97T002387		Lower half	<223	<224	<224[QC:c]
S98T000720	224:10	Whole	<196	<195	<196
S97T002402	224:11	Upper half	<201	<201	<201
S97T002397		Lower half	<197	<192	<195
Liquids			**μg/mL**	**μg/mL**	**μg/mL**
S97T002179	223:1	Drainable liquid	16.7	15.7	16.2
S97T002188	223:2	Drainable liquid	17.5	16.1	16.8
S97T002199	223:3	Drainable liquid	18.5	18.2	18.4
S97T002200	223:4	Drainable liquid	19.2	17.6	18.4
S97T002215	223:5	Drainable liquid	18.6	17.6	18.1
S97T002323	224:1	Drainable liquid	17.9	18.2	18[QC:c]
S97T002371	224:3	Drainable liquid	17.4	17.7	17.5
S97T002372	224:5	Drainable liquid	15.7	17	16.4[QC:c]

Table B2-37. Tank 241-SX-106 Analytical Results: Sodium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			μg/g	μg/g	μg/g
S98T000695	223:6	Whole	1.06E+05	1.06E+05	1.06E+05[QC:b]
S98T000705	223:6A	Whole	97000	1.05E+05	1.01E+05[QC:b,c,h]
S98T000706	223:9	Whole	1.03E+05	1.04E+05	1.04E+05[QC:b]
S98T000721	224:2	Whole	89100	89700	89400[QC:b,d]
S98T000722	224:4	Whole	92400	91000	91700[QC:b]
S98T000723	224:7	Whole	1.07E+05	1.07E+05	1.07E+05[QC:b,d]
S98T000724	224:10	Whole	1.14E+05	1.12E+05	1.13E+05[QC:b]
Solids: fusion			μg/g	μg/g	μg/g
S97T002177	223:1	Lower half	2.14E+05	2.03E+05	2.09E+05
S97T002185	223:2	Lower half	1.57E+05	1.53E+05	1.55E+05
S97T002194	223:3	Lower half	2.05E+05	2.03E+05	2.04E+05[QC:d]
S97T002204	223:4	Lower half	2.00E+05	2.06E+05	2.03E+05
S97T002231	223:5	Lower half	1.62E+05	1.62E+05	1.62E+05
S98T000694	223:6	Whole	1.07E+05	1.04E+05	1.06E+05
S98T000703	223:6A	Whole	1.01E+05	1.03E+05	1.02E+05
S97T002233	223:7	Upper half	1.84E+05	1.87E+05	1.86E+05
S97T002232		Lower half	1.99E+05	1.95E+05	1.97E+05
S97T002235	223:8	Upper half	1.84E+05	1.82E+05	1.83E+05
S97T002234		Lower half	2.12E+05	2.11E+05	2.12E+05
S98T000704	223:9	Whole	1.05E+05	1.04E+05	1.05E+05
S97T002265	223:10	Upper half	2.12E+05	2.19E+05	2.16E+05
S97T002263		Lower half	2.05E+05	2.06E+05	2.06E+05
S97T002320	224:1	Lower half	1.62E+05	1.59E+05	1.61E+05
S98T000717	224:2	Whole	94,700	93,700	94,200
S97T002334	224:3	Lower half	1.60E+05	1.57E+05	1.59E+05
S98T000718	224:4	Whole	1.00E+05	1.00E+05	1.00E+05
S97T002360	224:5	Upper half	1.78E+05	1.58E+05	1.68E+05
S97T002359		Lower half	1.68E+05	1.72E+05	1.70E+05
S97T002362	224:6	Upper half	1.81E+05	1.80E+05	1.81E+05
S97T002361		Lower half	1.69E+05	1.72E+05	1.71E+05

Table B2-37. Tank 241-SX-106 Analytical Results: Sodium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			μg/g	μg/g	μg/g
S98T000719	224:7	Whole	1.03E+05	1.03E+05	1.03E+05
S97T002364	224:8	Upper half	2.04E+05	2.10E+05	2.07E+05
S97T002363		Lower half	2.01E+05	2.08E+05	2.05E+05[QC:c]
S97T002392	224:9	Upper half	2.08E+05	2.10E+05	2.09E+05
S97T002387		Lower half	1.92E+05	1.93E+05	1.93E+05
S98T000720	224:10	Whole	1.08E+05	1.10E+05	1.09E+05
S97T002402	224:11	Upper half	1.82E+05	1.81E+05	1.82E+05
S97T002397		Lower half	2.16E+05	2.07E+05	2.12E+05
Liquids			μg/mL	μg/mL	μg/mL
S97T002179	223:1	Drainable liquid	2.40E+05	2.28E+05	2.34E+05
S97T002188	223:2	Drainable liquid	2.43E+05	2.27E+05	2.35E+05
S97T002199	223:3	Drainable liquid	2.45E+05	2.46E+05	2.46E+05[QC:c]
S97T002200	223:4	Drainable liquid	2.53E+05	2.40E+05	2.47E+05[QC:c]
S97T002215	223:5	Drainable liquid	2.60E+05	2.50E+05	2.55E+05
S97T002323	224:1	Drainable liquid	2.64E+05	2.70E+05	2.67E+05[QC:c]
S97T002371	224:3	Drainable liquid	2.44E+05	2.45E+05	2.45E+05
S97T002372	224:5	Drainable liquid	2.30E+05	2.35E+05	2.33E+05[QC:d]

Table B2-38. Tank 241-SX-106 Analytical Results: Strontium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S98T000695	223:6	Whole	<4.01	<3.76	<3.88
S98T000705	223:6A	Whole	<3.75	<3.93	<3.84
S98T000706	223:9	Whole	<3.8	<3.76	<3.78
S98T000721	224:2	Whole	<2.42	<1.75	<2.08
S98T000722	224:4	Whole	<1.94	<1.92	<1.93
S98T000723	224:7	Whole	<3.93	<3.88	<3.91
S98T000724	224:10	Whole	<3.6	<3.53	<3.56
Solids: fusion			µg/g	µg/g	µg/g
S97T002177	223:1	Lower half	<208	<204	<206
S97T002185	223:2	Lower half	<192	<189	<191
S97T002194	223:3	Lower half	<188	<187	<188
S97T002204	223:4	Lower half	<220	<215	<218
S97T002231	223:5	Lower half	<184	<190	<187
S98T000694	223:6	Whole	<193	<189	<191
S98T000703	223:6A	Whole	<185	<189	<187
S97T002233	223:7	Upper half	<210	<200	<205
S97T002232		Lower half	<196	<203	<200
S97T002235	223:8	Upper half	<203	<202	<203
S97T002234		Lower half	<198	<201	<200
S98T000704	223:9	Whole	<202	<204	<203
S97T002265	223:10	Upper half	<197	<197	<197
S97T002263		Lower half	<205	<205	<205
S97T002320	224:1	Lower half	<190	<185	<188
S98T000717	224:2	Whole	<202	<195	<199
S97T002334	224:3	Lower half	<183	<185	<184
S98T000718	224:4	Whole	<201	<199	<200
S97T002360	224:5	Upper half	<200	<204	<202
S97T002359		Lower half	<202	<200	<201
S97T002362	224:6	Upper half	<182	<175	<179
S97T002361		Lower half	<193	<196	<195

Table B2-38. Tank 241-SX-106 Analytical Results: Strontium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			µg/g	µg/g	µg/g
S98T000719	224:7	Whole	<193	<200	<197
S97T002364	224:8	Upper half	<202	<201	<202
S97T002363		Lower half	<185	<181	<183
S97T002392	224:9	Upper half	<219	<219	<219
S97T002387		Lower half	<223	<224	<224
S98T000720	224:10	Whole	<196	<195	<196
S97T002402	224:11	Upper half	<201	<201	<201
S97T002397		Lower half	<197	<192	<195
Liquids			µg/mL	µg/mL	µg/mL
S97T002179	223:1	Drainable liquid	<6.01	<6.01	<6.01
S97T002188	223:2	Drainable liquid	<6.01	<6.01	<6.01
S97T002199	223:3	Drainable liquid	<6.01	<6.01	<6.01
S97T002200	223:4	Drainable liquid	<6.01	<6.01	<6.01
S97T002215	223:5	Drainable liquid	<6.01	<6.01	<6.01
S97T002323	224:1	Drainable liquid	<6.01	<6.01	<6.01
S97T002371	224:3	Drainable liquid	<6.01	<6.01	<6.01
S97T002372	224:5	Drainable liquid	<6.01	<6.01	<6.01

Table B2-39. Tank 241-SX-106 Analytical Results: Sulfur (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			**µg/g**	**µg/g**	**µg/g**
S98T000695	223:6	Whole	2,190	2,200	2,200
S98T000705	223:6A	Whole	1,710	717	1210[QC:e]
S98T000706	223:9	Whole	692	688	690
S98T000721	224:2	Whole	735	746	741
S98T000722	224:4	Whole	772	775	774
S98T000723	224:7	Whole	1,680	1,690	1,690
S98T000724	224:10	Whole	1,250	1,250	1,250
Solids: fusion			**µg/g**	**µg/g**	**µg/g**
S97T002177	223:1	Lower half	<2,080	<2,040	<2,060
S97T002185	223:2	Lower half	<1,920	<1,890	<1,910
S97T002194	223:3	Lower half	<1,880	<1,870	<1,880
S97T002204	223:4	Lower half	<2,200	<2,150	<2,180
S97T002231	223:5	Lower half	<1,840	<1,900	<1,870
S98T000694	223:6	Whole	2,170	1,980	2,080
S98T000703	223:6A	Whole	<1,850	<1,890	<1,870
S97T002233	223:7	Upper half	3,320	3,200	3,260
S97T002232		Lower half	1,990	2,050	2,020
S97T002235	223:8	Upper half	<2,030	<2,020	<2,030
S97T002234		Lower half	<1,980	<2,010	<2,000
S98T000704	223:9	Whole	<2,020	<2,040	<2,030
S97T002265	223:10	Upper half	<1,970	<1,970	<1,970
S97T002263		Lower half	4,290	3,120	3,710[QC:e]
S97T002320	224:1	Lower half	<1,900	<1,850	<1,880
S98T000717	224:2	Whole	<2,020	<1,950	<1,990
S97T002334	224:3	Lower half	<1,830	<1,850	<1,840
S98T000718	224:4	Whole	<2,010	<1,990	<2,000
S97T002360	224:5	Upper half	<2,000	<2,040	<2,020
S97T002359		Lower half	3,090	3,180	3,140
S97T002362	224:6	Upper half	2,420	2,750	2,590
S97T002361		Lower half	2,260	2,620	2,440

Table B2-39. Tank 241-SX-106 Analytical Results: Sulfur (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			µg/g	µg/g	µg/g
S98T000719	224:7	Whole	<1,930	<2,000	<1,970
S97T002364	224:8	Upper half	2,260	<2,010	<2,140
S97T002363		Lower half	1,950	<1,810	<1,880
S97T002392	224:9	Upper half	<2,190	<2,190	<2,190
S97T002387		Lower half	<2,230	<2,240	<2,240
S98T000720	224:10	Whole	<1,960	<1,950	<1,960
S97T002402	224:11	Upper half	<2,010	<2,010	<2,010
S97T002397		Lower half	<1,970	<1,920	<1,950
Liquids			µg/mL	µg/mL	µg/mL
S97T002179	223:1	Drainable liquid	2,340	2,260	2,300
S97T002188	223:2	Drainable liquid	2,330	2,200	2,270
S97T002199	223:3	Drainable liquid	2,440	2,440	2,440[QC:c]
S97T002200	223:4	Drainable liquid	2,490	2,390	2,440[QC:c]
S97T002215	223:5	Drainable liquid	2,430	2,490	2,460
S97T002323	224:1	Drainable liquid	2,510	2,530	2,520
S97T002371	224:3	Drainable liquid	2,360	2,400	2,380
S97T002372	224:5	Drainable liquid	2,380	2,420	2,400

Table B2-40. Tank 241-SX-106 Analytical Results: Thallium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S98T000695	223:6	Whole	<80.3	<75.2	<77.8
S98T000705	223:6A	Whole	<75	<78.6	<76.8
S98T000706	223:9	Whole	<76	<75.2	<75.6
S98T000721	224:2	Whole	<48.4	<35.1	<41.8
S98T000722	224:4	Whole	<38.9	<38.3	<38.6
S98T000723	224:7	Whole	<78.6	<77.6	<78.1
S98T000724	224:10	Whole	<72	<70.6	<71.3
Solids: fusion			µg/g	µg/g	µg/g
S97T002177	223:1	Lower half	<4,160	<4,070	<4,120
S97T002185	223:2	Lower half	<3,830	<3,780	<3,810
S97T002194	223:3	Lower half	<3,760	<3,730	<3,750
S97T002204	223:4	Lower half	<4,400	<4,300	<4,350
S97T002231	223:5	Lower half	<3,690	<3,800	<3,750
S98T000694	223:6	Whole	<3,860	<3,780	<3,820
S98T000703	223:6A	Whole	<3,700	<3,770	<3,740
S97T002233	223:7	Upper half	<4,200	<4,010	<4,110
S97T002232		Lower half	<3,920	<4,060	<3,990
S97T002235	223:8	Upper half	<4,050	<4,040	<4,050
S97T002234		Lower half	<3,970	<4,010	<3,990
S98T000704	223:9	Whole	<4,040	<4,080	<4,060
S97T002265	223:10	Upper half	<3,940	<3,930	<3,940
S97T002263		Lower half	<4,100	<4,100	<4,100
S97T002320	224:1	Lower half	<3,800	<3,690	<3,750
S98T000717	224:2	Whole	<4,050	<3,900	<3,980
S97T002334	224:3	Lower half	<3,660	<3,690	<3,680
S98T000718	224:4	Whole	<4,030	<3,980	<4,010
S97T002360	224:5	Upper half	<4,000	<4,070	<4,040
S97T002359		Lower half	<4,040	<4,000	<4,020
S97T002362	224:6	Upper half	<3,640	<3,490	<3,570
S97T002361		Lower half	<3,870	<3,910	<3,890

Table B2-40. Tank 241-SX-106 Analytical Results: Thallium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			µg/g	µg/g	µg/g
S98T000719	224:7	Whole	<3,870	<4,000	<3,940
S97T002364	224:8	Upper half	<4,040	<4,010	<4,030
S97T002363		Lower half	<3,690	<3,620	<3,660
S97T002392	224:9	Upper half	<4,370	<4,380	<4,380
S97T002387		Lower half	<4,470	<4,480	<4,480
S98T000720	224:10	Whole	<3,930	<3,900	<3,920
S97T002402	224:11	Upper half	<4,020	<4,010	<4,020
S97T002397		Lower half	<3,940	<3,850	<3,900
Liquids			µg/mL	µg/mL	µg/mL
S97T002179	223:1	Drainable liquid	<120	<120	<120
S97T002188	223:2	Drainable liquid	<120	<120	<120
S97T002199	223:3	Drainable liquid	<120	<120	<120
S97T002200	223:4	Drainable liquid	<120	<120	<120
S97T002215	223:5	Drainable liquid	<120	<120	<120
S97T002323	224:1	Drainable liquid	<120	<120	<120
S97T002371	224:3	Drainable liquid	<120	<120	<120
S97T002372	224:5	Drainable liquid	<120	<120	<120

Table B2-41. Tank 241-SX-106 Analytical Results: Titanium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S98T000695	223:6	Whole	<4.01	<3.76	<3.88
S98T000705	223:6A	Whole	<3.75	<3.93	<3.84
S98T000706	223:9	Whole	<3.8	<3.76	<3.78
S98T000721	224:2	Whole	<2.42	<1.75	<2.08
S98T000722	224:4	Whole	<1.94	<1.92	<1.93
S98T000723	224:7	Whole	<3.93	<3.88	<3.91
S98T000724	224:10	Whole	<3.6	<3.53	<3.56
Solids: fusion			µg/g	µg/g	µg/g
S97T002177	223:1	Lower half	<208	<204	<206
S97T002185	223:2	Lower half	<192	<189	<191
S97T002194	223:3	Lower half	<188	<187	<188
S97T002204	223:4	Lower half	<220	<215	<218
S97T002231	223:5	Lower half	<184	<190	<187
S98T000694	223:6	Whole	<193	<189	<191
S98T000703	223:6A	Whole	<185	<189	<187
S97T002233	223:7	Upper half	<210	<200	<205
S97T002232		Lower half	<196	<203	<200
S97T002235	223:8	Upper half	<203	<202	<203
S97T002234		Lower half	<198	<201	<200
S98T000704	223:9	Whole	<202	<204	<203
S97T002265	223:10	Upper half	<197	<197	<197
S97T002263		Lower half	<205	<205	<205
S97T002320	224:1	Lower half	<190	<185	<188
S98T000717	224:2	Whole	<202	<195	<199
S97T002334	224:3	Lower half	<183	<185	<184
S98T000718	224:4	Whole	<201	<199	<200
S97T002360	224:5	Upper half	<200	<204	<202
S97T002359		Lower half	<202	<200	<201

Table B2-41. Tank 241-SX-106 Analytical Results: Titanium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			µg/g	µg/g	µg/g
S97T002362	224:6	Upper half	<182	<175	<179
S97T002361		Lower half	<193	<196	<195
S98T000719	224:7	Whole	<193	<200	<197
S97T002364	224:8	Upper half	<202	<201	<202
S97T002363		Lower half	<185	<181	<183
S97T002392	224:9	Upper half	<219	<219	<219
S97T002387		Lower half	<223	<224	<224
S98T000720	224:10	Whole	<196	<195	<196
S97T002402	224:11	Upper half	<201	<201	<201
S97T002397		Lower half	<197	<192	<195
Liquids			µg/mL	µg/mL	µg/mL
S97T002179	223:1	Drainable liquid	<6.01	<6.01	<6.01
S97T002188	223:2	Drainable liquid	<6.01	<6.01	<6.01
S97T002199	223:3	Drainable liquid	<6.01	<6.01	<6.01
S97T002200	223:4	Drainable liquid	<6.01	<6.01	<6.01
S97T002215	223:5	Drainable liquid	<6.01	<6.01	<6.01
S97T002323	224:1	Drainable liquid	<6.01	<6.01	<6.01
S97T002371	224:3	Drainable liquid	<6.01	<6.01	<6.01
S97T002372	224:5	Drainable liquid	<6.01	<6.01	<6.01

Table B2-42. Tank 241-SX-106 Analytical Results: Total Uranium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S98T000695	223:6	Whole	<201	<188	<195
S98T000705	223:6A	Whole	<187	<196	<192
S98T000706	223:9	Whole	<190	<188	<189
S98T000721	224:2	Whole	<121	<87.6	<104
S98T000722	224:4	Whole	<97.2	<95.8	<96.5
S98T000723	224:7	Whole	<197	<194	<196
S98T000724	224:10	Whole	194	191	193
Solids: fusion			µg/g	µg/g	µg/g
S97T002177	223:1	Lower half	<10,400	<10,200	<10,300
S97T002185	223:2	Lower half	<9,580	<9,460	<9,520
S97T002194	223:3	Lower half	<9,390	<9,340	<9,370
S97T002204	223:4	Lower half	<11,000	<10,700	<10,900
S97T002231	223:5	Lower half	<9,220	<9,510	<9,370
S98T000694	223:6	Whole	<9,650	<9,460	<9,560
S98T000703	223:6A	Whole	<9,260	<9,430	<9,350
S97T002233	223:7	Upper half	<10,500	<10,000	<10,300
S97T002232		Lower half	<9,790	<10,100	<9,950
S97T002235	223:8	Upper half	<10,100	<10,100	<10,100
S97T002234		Lower half	<9,920	<10,000	<9,960
S98T000704	223:9	Whole	<10,100	<10,200	<10,200
S97T002265	223:10	Upper half	<9,850	<9,840	<9,850
S97T002263		Lower half	<10,200	<10,300	<10,300
S97T002320	224:1	Lower half	<9,500	<9,230	<9,370
S98T000717	224:2	Whole	<10,100	<9,760	<9,930
S97T002334	224:3	Lower half	<9,140	<9,230	<9,190
S98T000718	224:4	Whole	<10,100	<9,950	<10,000
S97T002360	224:5	Upper half	<9,990	<10,200	<10,100
S97T002359		Lower half	<10,100	<9,990	<10,000
S97T002362	224:6	Upper half	<9,100	<8,730	<8,920
S97T002361		Lower half	<9,670	<9,780	<9,730

Table B2-42. Tank 241-SX-106 Analytical Results: Total Uranium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			µg/g	µg/g	µg/g
S98T000719	224:7	Whole	<9,670	<9,990	<9,830
S97T002364	224:8	Upper half	<10,100	<10,000	<10,100
S97T002363		Lower half	<9,230	<9,050	<9,140
S97T002392	224:9	Upper half	<10,900	<11,000	<11,000
S97T002387		Lower half	<11,200	<11,200	<11,200
S98T000720	224:10	Whole	<9,820	<9,760	<9,790
S97T002402	224:11	Upper half	<10,100	<10,000	<10,100
S97T002397		Lower half	<9840	<9,620	<9,730
Liquids			µg/mL	µg/mL	µg/mL
S97T002179	223:1	Drainable liquid	<300	<300	<300
S97T002188	223:2	Drainable liquid	<300	<300	<300
S97T002199	223:3	Drainable liquid	<300	<300	<300
S97T002200	223:4	Drainable liquid	<300	<300	<300
S97T002215	223:5	Drainable liquid	<300	<300	<300
S97T002323	224:1	Drainable liquid	<300	<300	<300
S97T002371	224:3	Drainable liquid	<300	<300	<300
S97T002372	224:5	Drainable liquid	<300	<300	<300

Table B2-43. Tank 241-SX-106 Analytical Results: Vanadium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S98T000695	223:6	Whole	<20.1	<18.8	<19.5
S98T000705	223:6A	Whole	<18.7	<19.6	<19.1
S98T000706	223:9	Whole	<19	<18.8	<18.9
S98T000721	224:2	Whole	<12.1	<8.76	<10.4
S98T000722	224:4	Whole	<9.72	<9.58	<9.65
S98T000723	224:7	Whole	<19.7	<19.4	<19.5
S98T000724	224:10	Whole	<18	<17.7	<17.9
Solids: fusion			µg/g	µg/g	µg/g
S97T002177	223:1	Lower half	<1,040	<1,020	<1,030
S97T002185	223:2	Lower half	<958	<946	<952
S97T002194	223:3	Lower half	<939	<934	<937
S97T002204	223:4	Lower half	<1,100	<1,070	<1,090
S97T002231	223:5	Lower half	<922	<951	<937
S98T000694	223:6	Whole	<965	<946	<956
S98T000703	223:6A	Whole	<926	<943	<935
S97T002233	223:7	Upper half	<1,050	<1,000	<1,030
S97T002232		Lower half	<979	<1,010	<995
S97T002235	223:8	Upper half	<1,010	<1,010	<1,010
S97T002234		Lower half	<992	<1,000	<996
S98T000704	223:9	Whole	<1,010	<1,020	<1,020
S97T002265	223:10	Upper half	<985	<984	<985
S97T002263		Lower half	<1,020	<1,030	<1,030
S97T002320	224:1	Lower half	<950	<923	<937
S98T000717	224:2	Whole	<1,010	<976	<993
S97T002334	224:3	Lower half	<914	<923	<919
S98T000718	224:4	Whole	<1,010	<995	<1,000
S97T002360	224:5	Upper half	<999	<1,020	<1,010
S97T002359		Lower half	<1,010	<999	<1,000
S97T002362	224:6	Upper half	<910	<873	<892
S97T002361		Lower half	<967	<978	<973

Table B2-43. Tank 241-SX-106 Analytical Results: Vanadium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			μg/g	μg/g	μg/g
S98T000719	224:7	Whole	<967	<999	<983
S97T002364	224:8	Upper half	<1,010	<1,000	<1,010
S97T002363		Lower half	<923	<905	<914
S97T002392	224:9	Upper half	<1,090	<1,100	<1,100
S97T002387		Lower half	<1,120	<1,120	<1,120
S98T000720	224:10	Whole	<982	<976	<979
S97T002402	224:11	Upper half	<1,010	<1,000	<1,010
S97T002397		Lower half	<984	<962	<973
Liquids			μg/mL	μg/mL	μg/mL
S97T002179	223:1	Drainable liquid	<30.1	<30.1	<30.1
S97T002188	223:2	Drainable liquid	<30.1	<30.1	<30.1
S97T002199	223:3	Drainable liquid	<30.1	<30.1	<30.1
S97T002200	223:4	Drainable liquid	<30.1	<30.1	<30.1
S97T002215	223:5	Drainable liquid	<30.1	<30.1	<30.1
S97T002323	224:1	Drainable liquid	<30.1	<30.1	<30.1
S97T002371	224:3	Drainable liquid	<30.1	<30.1	<30.1
S97T002372	224:5	Drainable liquid	<30.1	<30.1	<30.1

Table B2-44. Tank 241-SX-106 Analytical Results: Zinc (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S98T000695	223:6	Whole	22.2	20.1	21.1
S98T000705	223:6A	Whole	26.4	21	23.7[QC:e]
S98T000706	223:9	Whole	22.3	20.3	21.3
S98T000721	224:2	Whole	19	13.5	16.3[QC:e]
S98T000722	224:4	Whole	15.8	14.8	15.3
S98T000723	224:7	Whole	20.1	20.1	20.1
S98T000724	224:10	Whole	23.1	23	23.1
Solids: fusion			µg/g	µg/g	µg/g
S97T002177	223:1	Lower half	<208	<204	<206
S97T002185	223:2	Lower half	<192	<189	<191
S97T002194	223:3	Lower half	<188	<187	<188
S97T002204	223:4	Lower half	<220	<215	<218
S97T002231	223:5	Lower half	<184	<190	<187
S98T000694	223:6	Whole	<193	<189	<191
S98T000703	223:6A	Whole	<185	<189	<187
S97T002233	223:7	Upper half	<210	<200	<205
S97T002232		Lower half	<196	<203	<200
S97T002235	223:8	Upper half	<203	<202	<203
S97T002234		Lower half	<198	<201	<200
S98T000704	223:9	Whole	<202	<204	<203
S97T002265	223:10	Upper half	<197	<197	<197
S97T002263		Lower half	<205	<205	<205
S97T002320	224:1	Lower half	<190	<185	<188
S98T000717	224:2	Whole	<202	<195	<199
S97T002334	224:3	Lower half	<183	<185	<184
S98T000718	224:4	Whole	<201	<199	<200
S97T002360	224:5	Upper half	<200	<204	<202
S97T002359		Lower half	<202	<200	<201
S97T002362	224:6	Upper half	<182	<175	<179
S97T002361		Lower half	<193	<196	<195

Table B2-44. Tank 241-SX-106 Analytical Results: Zinc (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			μg/g	μg/g	μg/g
S98T000719	224:7	Whole	<193	<200	<197
S97T002364	224:8	Upper half	<202	233	<218
S97T002363		Lower half	<185	<181	<183
S97T002392	224:9	Upper half	<219	<219	<219
S97T002387		Lower half	<223	<224	<224
S98T000720	224:10	Whole	<196	<195	<196
S97T002402	224:11	Upper half	<201	<201	<201
S97T002397		Lower half	<197	<192	<195
Liquids			μg/mL	μg/mL	μg/mL
S97T002179	223:1	Drainable liquid	<6.01	<6.01	<6.01
S97T002188	223:2	Drainable liquid	<6.01	<6.01	<6.01
S97T002199	223:3	Drainable liquid	<6.01	<6.01	<6.01
S97T002200	223:4	Drainable liquid	<6.01	<6.01	<6.01
S97T002215	223:5	Drainable liquid	<6.01	<6.01	<6.01
S97T002323	224:1	Drainable liquid	<6.01	<6.01	<6.01
S97T002371	224:3	Drainable liquid	<6.01	<6.01	<6.01
S97T002372	224:5	Drainable liquid	<6.01	<6.01	<6.01

Table B2-45. Tank 241-SX-106 Analytical Results: Zirconium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			μg/g	μg/g	μg/g
S98T000695	223:6	Whole	9.19	8.93	9.06
S98T000705	223:6A	Whole	15.4	11.4	13.4[QC:e]
S98T000706	223:9	Whole	10.9	10.2	10.6
S98T000721	224:2	Whole	<2.42	<1.75	<2.08
S98T000722	224:4	Whole	<1.94	<1.92	<1.93
S98T000723	224:7	Whole	5.42	6.3	5.86
S98T000724	224:10	Whole	25.7	23.9	24.8
Solids: fusion			μg/g	μg/g	μg/g
S97T002177	223:1	Lower half	<208	<204	<206
S97T002185	223:2	Lower half	<192	<189	<191
S97T002194	223:3	Lower half	<188	<187	<188
S97T002204	223:4	Lower half	<220	<215	<218
S97T002231	223:5	Lower half	<184	<190	<187
S98T000694	223:6	Whole	<193	<189	<191
S98T000703	223:6A	Whole	<185	<189	<187
S97T002233	223:7	Upper half	<210	<200	<205
S97T002232		Lower half	<196	<203	<200
S97T002235	223:8	Upper half	<203	<202	<203
S97T002234		Lower half	<198	<201	<200
S98T000704	223:9	Whole	<202	<204	<203
S97T002265	223:10	Upper half	<197	<197	<197
S97T002263		Lower half	<205	<205	<205
S97T002320	224:1	Lower half	<190	<185	<188
S98T000717	224:2	Whole	<202	<195	<199
S97T002334	224:3	Lower half	<183	<185	<184
S98T000718	224:4	Whole	<201	<199	<200
S97T002360	224:5	Upper half	<200	<204	<202
S97T002359		Lower half	<202	<200	<201
S97T002362	224:6	Upper half	<182	<175	<179
S97T002361		Lower half	<193	<196	<195

Table B2-45. Tank 241-SX-106 Analytical Results: Zirconium (ICP). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion (Cont'd)			µg/g	µg/g	µg/g
S98T000719	224:7	Whole	<193	<200	<197
S97T002364	224:8	Upper half	<202	<201	<202
S97T002363		Lower half	<185	<181	<183
S97T002392	224:9	Upper half	<219	<219	<219
S97T002387		Lower half	<223	<224	<224
S98T000720	224:10	Whole	<196	<195	<196
S97T002402	224:11	Upper half	<201	<201	<201
S97T002397		Lower half	<197	<192	<195
Liquids			µg/mL	µg/mL	µg/mL
S97T002179	223:1	Drainable liquid	<6.01	<6.01	<6.01
S97T002188	223:2	Drainable liquid	<6.01	<6.01	<6.01
S97T002199	223:3	Drainable liquid	<6.01	<6.01	<6.01
S97T002200	223:4	Drainable liquid	<6.01	<6.01	<6.01
S97T002215	223:5	Drainable liquid	<6.01	<6.01	<6.01
S97T002323	224:1	Drainable liquid	<6.01	<6.01	<6.01
S97T002371	224:3	Drainable liquid	<6.01	<6.01	<6.01
S97T002372	224:5	Drainable liquid	<6.01	<6.01	<6.01

Table B2-46. Tank 241-SX-106 Analytical Results: Bromide (IC). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			µg/g	µg/g	µg/g
S97T002178	223:1	Lower half	<962	<973	<967
S97T002186	223:2	Lower half	<941	<897	<919
S97T002196	223:3	Lower half	<1,150	<1,160	<1,150
S97T002205	223:4	Lower half	1,160	1,240	1,200
S97T002237	223:5	Lower half	<1,040	<983	<1,010
S98T000696	223:6	Whole	<950	<937	<944
S98T000707	223:6A	Whole	574	558	566
S97T002239	223:7	Upper half	2,790	2,660	2,730
S97T002238		Lower half	<1,010	<1,000	<1,000
S97T002241	223:8	Upper half	1,820	1,730	1,780
S97T002240		Lower half	<1,000	<987	<994
S98T000708	223:9	Whole	2.14E+05	2.15E+05	2.14E+05
S97T002266	223:10	Upper half	2,630	2,590	2,610
S97T002264		Lower half	2,820	2,780	2,800
S97T002321	224:1	Lower half	<944	<1,020	<982
S98T000725	224:2	Whole	<505	<506	<505
S97T002335	224:3	Lower half	<957	<959	<958
S98T000726	224:4	Whole	<507	<516	<511
S97T002354	224:5	Upper half	<1,020	<1,020	<1,020
S97T002353		Lower half	<1,000	<957	<980
S97T002356	224:6	Upper half	<848	<767	<807
S97T002355		Lower half	<988	<1,020	<1,000
S98T000727	224:7	Whole	<948	<900	<924
S97T002358	224:8	Upper half	1,970	1,910	1,940
S97T002357		Lower half	<967	<953	<960
S97T002393	224:9	Upper half	1,330	1,360	1,340
S97T002388		Lower half	2,510	<2,340	<2,430
S98T000728	224:10	Whole	<973	<985	<979
S97T002403	224:11	Upper half	1,080	1,040	1,060
S97T002398		Lower half	1,040	997	1,020

Table B2-46. Tank 241-SX-106 Analytical Results: Bromide (IC). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Liquids			µg/mL	µg/mL	µg/mL
S97T002179	223:1	Drainable liquid	<644	<644	<644
S97T002188	223:2	Drainable liquid	764	756	760
S97T002199	223:3	Drainable liquid	719	740	729
S97T002200	223:4	Drainable liquid	1,380	1,360	1,370
S97T002215	223:5	Drainable liquid	<1,280	1,330	<1,300
S97T002323	224:1	Drainable liquid	<1,280	<1,280	<1,280
S97T002371	224:3	Drainable liquid	1,360	1,320	1,340
S97T002372	224:5	Drainable liquid	846	779	812

Table B2-47. Tank 241-SX-106 Analytical Results: Chloride (IC). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			µg/g	µg/g	µg/g
S97T002178	223:1	Lower half	2,990	2,870	2,930
S97T002186	223:2	Lower half	6,620	6,740	6,680
S97T002196	223:3	Lower half	3,470	3,430	3,450
S97T002205	223:4	Lower half	2,770	3,080	2,930
S97T002237	223:5	Lower half	7,000	6,600	6,800
S98T000696	223:6	Whole	4,050	3,570	3,810
S98T000707	223:6A	Whole	3,910	3,660	3,780
S97T002239	223:7	Upper half	7,210	6,890	7,050
S97T002238		Lower half	6,140	6,000	6,070
S97T002241	223:8	Upper half	7,840	7,340	7,590
S97T002240		Lower half	5,260	5,170	5,210
S98T000708	223:9	Whole	2,870	2,850	2,860
S97T002266	223:10	Upper half	11,900	12,300	12,100
S97T002264		Lower half	13,900	14,000	13,900
S97T002321	224:1	Lower half	6,960	7,600	7,280
S98T000725	224:2	Whole	3,750	4,480	4,120
S97T002335	224:3	Lower half	7,950	7,220	7,580
S98T000726	224:4	Whole	4,820	4,170	4,490
S97T002354	224:5	Upper half	6,690	6,160	6,430
S97T002353		Lower half	7,060	7,090	7,070
S97T002356	224:6	Upper half	7,610	8,120	7,870
S97T002355		Lower half	7,910	8,900	8,410
S98T000727	224:7	Whole	3,330	3,150	3,240
S97T002358	224:8	Upper half	6,170	5,240	5,700
S97T002357		Lower half	6,150	6,640	6,390
S97T002393	224:9	Upper half	4,490	4,960	4,720
S97T002388		Lower half	5,490	5,430	5,460
S98T000728	224:10	Whole	3,070	3,140	3,100
S97T002403	224:11	Upper half	9,330	9,940	9,640
S97T002398		Lower half	5,070	5,020	5,050

Table B2-47. Tank 241-SX-106 Analytical Results: Chloride (IC). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Liquids			μg/mL	μg/mL	μg/mL
S97T002179	223:1	Drainable liquid	12,000	12,000	12,000
S97T002188	223:2	Drainable liquid	11,500	11,500	11,500
S97T002199	223:3	Drainable liquid	11,400	11,400	11,400
S97T002200	223:4	Drainable liquid	11,400	11,300	11,400
S97T002215	223:5	Drainable liquid	12,300	13,000	12,700
S97T002323	224:1	Drainable liquid	12,200	12,500	12,300
S97T002371	224:3	Drainable liquid	11,000	11,100	11,100
S97T002372	224:5	Drainable liquid	11,700	11,500	11,600

Table B2-48. Tank 241-SX-106 Analytical Results: Fluoride (IC). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			µg/g	µg/g	µg/g
S97T002178	223:1	Lower half	<92.3	<93.4	<92.9
S97T002186	223:2	Lower half	<90.4	<86.1	<88.2
S97T002196	223:3	Lower half	<110	<111	<111
S97T002205	223:4	Lower half	<110	<117	<113
S97T002237	223:5	Lower half	404	422	413
S98T000696	223:6	Whole	227	186	207
S98T000707	223:6A	Whole	174	170	172
S97T002239	223:7	Upper half	675	639	657
S97T002238		Lower half	483	600	542[QC:e]
S97T002241	223:8	Upper half	283	274	279
S97T002240		Lower half	217	188	202[QC:c]
S98T000708	223:9	Whole	135	144	140
S97T002266	223:10	Upper half	641	488	564[QC:c,e]
S97T002264		Lower half	551	505	528[QC:c]
S97T002321	224:1	Lower half	399	412	405[QC:c]
S98T000725	224:2	Whole	216	224	220
S97T002335	224:3	Lower half	404	386	395
S98T000726	224:4	Whole	233	225	229
S97T002354	224:5	Upper half	377	350	364
S97T002353		Lower half	741	572	657[QC:e]
S97T002356	224:6	Upper half	<81.4	<73.6	<77.5
S97T002355		Lower half	397	408	402
S98T000727	224:7	Whole	269	237	253
S97T002358	224:8	Upper half	610	595	602
S97T002357		Lower half	574	721	647[QC:e]
S97T002393	224:9	Upper half	359	358	359
S97T002388		Lower half	1,400	1,540	1,470
S98T000728	224:10	Whole	261	266	264
S97T002403	224:11	Upper half	1,380	1,500	1,440
S97T002398		Lower half	2,580	2,770	2,670

Table B2-48. Tank 241-SX-106 Analytical Results: Fluoride (IC). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Liquids			μg/mL	μg/mL	μg/mL
S97T002179	223:1	Drainable liquid	<61.8	<61.8	<61.8
S97T002188	223:2	Drainable liquid	<61.8	<61.8	<61.8
S97T002199	223:3	Drainable liquid	546	535	540
S97T002200	223:4	Drainable liquid	<61.8	<61.8	<61.8
S97T002215	223:5	Drainable liquid	572	598	585
S97T002323	224:1	Drainable liquid	408	426	417
S97T002371	224:3	Drainable liquid	409	<122	<265[QC:e]
S97T002372	224:5	Drainable liquid	496	497	496

Table B2-49. Tank 241-SX-106 Analytical Results: Nitrate (IC). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			µg/g	µg/g	µg/g
S97T002178	223:1	Lower half	4.72E+05	5.15E+05	4.93E+05[QC:d]
S97T002186	223:2	Lower half	1.36E+05	1.43E+05	1.40E+05
S97T002196	223:3	Lower half	4.46E+05	4.54E+05	4.50E+05
S97T002205	223:4	Lower half	4.02E+05	3.93E+05	3.98E+05
S97T002237	223:5	Lower half	1.51E+05	1.56E+05	1.53E+05
S98T000696	223:6	Whole	75,100	62,700	68,900
S98T000707	223:6A	Whole	82,800	76,300	79,600
S97T002239	223:7	Upper half	1.08E+05	1.06E+05	1.07E+05
S97T002238		Lower half	2.63E+05	2.46E+05	2.55E+05
S97T002241	223:8	Upper half	1.52E+05	1.54E+05	1.53E+05
S97T002240		Lower half	3.94E+05	3.57E+05	3.76E+05[QC:e]
S98T000708	223:9	Whole	<517	<510	<513
S97T002266	223:10	Upper half	9.59E+05	9.51E+05	9.55E+05[QC:e]
S97T002264		Lower half	7.91E+05	6.72E+05	7.31E+05
S97T002321	224:1	Lower half	1.82E+05	1.49E+05	1.65E+05
S98T000725	224:2	Whole	88000	98600	93300[QC:d]
S97T002335	224:3	Lower half	1.85E+05	2.06E+05	1.95E+05
S98T000726	224:4	Whole	1.03E+05	93,200	98,100
S97T002354	224:5	Upper half	1.75E+05	2.36E+05	2.05E+05[QC:e]
S97T002353		Lower half	1.12E+05	1.09E+05	1.10E+05
S97T002356	224:6	Upper half	97,400	1.01E+05	99,200
S97T002355		Lower half	94,000	94,900	94,500
S98T000727	224:7	Whole	1.21E+05	1.20E+05	1.21E+05
S97T002358	224:8	Upper half	2.28E+05	2.71E+05	2.50E+05
S97T002357		Lower half	2.96E+05	2.82E+05	2.89E+05
S97T002393	224:9	Upper half	4.12E+05	3.90E+05	4.01E+05
S97T002388		Lower half	2.97E+05	3.01E+05	2.99E+05
S98T000728	224:10	Whole	1.45E+05	1.46E+05	1.45E+05
S97T002403	224:11	Upper half	81,100	80,800	81,000
S97T002398		Lower half	2.47E+05	2.80E+05	2.63E+05

Table B2-49. Tank 241-SX-106 Analytical Results: Nitrate (IC). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Liquids			μg/mL	μg/mL	μg/mL
S97T002179	223:1	Drainable liquid	2.18E+05	2.21E+05	2.20E+05
S97T002188	223:2	Drainable liquid	2.21E+05	2.22E+05	2.21E+05
S97T002199	223:3	Drainable liquid	1.98E+05	2.01E+05	2.00E+05
S97T002200	223:4	Drainable liquid	2.26E+05	2.26E+05	2.26E+05
S97T002215	223:5	Drainable liquid	2.31E+05	2.32E+05	2.31E+05
S97T002323	224:1	Drainable liquid	1.98E+05	2.03E+05	2.00E+05
S97T002371	224:3	Drainable liquid	1.79E+05	1.85E+05	1.82E+05
S97T002372	224:5	Drainable liquid	1.98E+05	1.96E+05	1.97E+05

Table B2-50. Tank 241-SX-106 Analytical Results: Nitrite (IC). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			μg/g	μg/g	μg/g
S97T002178	223:1	Lower half	33,600	32,400	33,000
S97T002186	223:2	Lower half	77,900	80,400	79,100
S97T002196	223:3	Lower half	40,500	39,200	39,800
S97T002205	223:4	Lower half	31,400	35,200	33,300
S97T002237	223:5	Lower half	75,100	73,900	74,500
S98T000696	223:6	Whole	43,500	38,200	40,800
S98T000707	223:6A	Whole	42,200	40,500	41,400
S97T002239	223:7	Upper half	78,500	74,400	76,400
S97T002238		Lower half	68,400	66,100	67,300
S97T002241	223:8	Upper half	85,300	81,000	83,100
S97T002240		Lower half	57,800	57,200	57,500
S98T000708	223:9	Whole	30,300	31,000	30,600
S97T002266	223:10	Upper half	1.42E+05	1.45E+05	1.43E+05
S97T002264		Lower half	1.60E+05	1.59E+05	1.60E+05
S97T002321	224:1	Lower half	73,100	78,900	76,000
S98T000725	224:2	Whole	43,300	50,800	47,000[QC:d]
S97T002335	224:3	Lower half	82,600	76,300	79,500
S98T000726	224:4	Whole	53,500	47,100	50,300
S97T002354	224:5	Upper half	73,200	68,300	70,700
S97T002353		Lower half	74,700	77,100	75,900
S97T002356	224:6	Upper half	88,300	92,200	90,300
S97T002355		Lower half	83,700	93,100	88,400
S98T000727	224:7	Whole	35,600	35,000	35,300
S97T002358	224:8	Upper half	73,200	61,200	67,200
S97T002357		Lower half	68,100	71,000	69,600
S97T002393	224:9	Upper half	50,500	53,400	51,900
S97T002388		Lower half	58,800	55,400	57,100
S98T000728	224:10	Whole	36,600	38,200	37,400
S97T002403	224:11	Upper half	89,100	92,700	90,900
S97T002398		Lower half	58,300	59,400	58,800

Table B2-50. Tank 241-SX-106 Analytical Results: Nitrite (IC). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Liquids			μg/mL	μg/mL	μg/mL
S97T002179	223:1	Drainable liquid	1.40E+05	1.42E+05	1.41E+05
S97T002188	223:2	Drainable liquid	1.36E+05	1.36E+05	1.36E+05
S97T002199	223:3	Drainable liquid	1.28E+05	1.28E+05	1.28E+05
S97T002200	223:4	Drainable liquid	1.32E+05	1.33E+05	1.33E+05
S97T002215	223:5	Drainable liquid	1.35E+05	1.41E+05	1.38E+05
S97T002323	224:1	Drainable liquid	1.27E+05	1.34E+05	1.31E+05
S97T002371	224:3	Drainable liquid	1.21E+05	1.19E+05	1.20E+05
S97T002372	224:5	Drainable liquid	1.30E+05	1.30E+05	1.30E+05

Table B2-51. Tank 241-SX-106 Analytical Results: Phosphate (IC). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			µg/g	µg/g	µg/g
S97T002178	223:1	Lower half	9,300	9,890	9,590
S97T002186	223:2	Lower half	16,800	19,000	17,900
S97T002196	223:3	Lower half	10,300	9,810	10,100
S97T002205	223:4	Lower half	35,200	27,500	31,400[QC:e]
S97T002237	223:5	Lower half	18,700	13,300	16,000[QC:e]
S98T000696	223:6	Whole	4,240	4,040	4,140
S98T000707	223:6A	Whole	4,240	3,840	4,040
S97T002239	223:7	Upper half	13,000	10,900	11,900
S97T002238		Lower half	9,290	10,900	10,100
S97T002241	223:8	Upper half	5,870	5,410	5,640
S97T002240		Lower half	5,030	4,230	4,630
S98T000708	223:9	Whole	2,390	2,440	2,420
S97T002266	223:10	Upper half	17,300	15,600	16,500
S97T002264		Lower half	14,400	12,800	13,600
S97T002321	224:1	Lower half	16,900	14,800	15,800
S98T000725	224:2	Whole	2,340	2,680	2,510
S97T002335	224:3	Lower half	5,900	7,990	6,940[QC:e]
S98T000726	224:4	Whole	2,320	2,440	2,380
S97T002354	224:5	Upper half	17,900	17,000	17,400
S97T002353		Lower half	13,500	11,600	12,600
S97T002356	224:6	Upper half	8,630	8,630	8,630
S97T002355		Lower half	10,100	5,890	8,000[QC:e]
S98T000727	224:7	Whole	3,700	3,780	3,740
S97T002358	224:8	Upper half	11,600	11,700	11,700
S97T002357		Lower half	8,870	10,300	9,590
S97T002393	224:9	Upper half	5,960	4,910	5,430
S97T002388		Lower half	17,600	19,700	18,600
S98T000728	224:10	Whole	2,890	2,980	2,930
S97T002403	224:11	Upper half	20,500	21,300	20,900
S97T002398		Lower half	29,400	31,100	30,200

Table B2-51. Tank 241-SX-106 Analytical Results: Phosphate (IC). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Liquids			μg/mL	μg/mL	μg/mL
S97T002179	223:1	Drainable liquid	2,650	2,920	2,780
S97T002188	223:2	Drainable liquid	2,680	2,980	2,830
S97T002199	223:3	Drainable liquid	2,620	2,970	2,800
S97T002200	223:4	Drainable liquid	2,780	2,760	2,770
S97T002215	223:5	Drainable liquid	4,680	3,960	4,320
S97T002323	224:1	Drainable liquid	3,560	3,840	3,700
S97T002371	224:3	Drainable liquid	3,330	3,240	3,290
S97T002372	224:5	Drainable liquid	3,370	3,220	3,290

Table B2-52. Tank 241-SX-106 Analytical Results: Sulfate (IC). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			**µg/g**	**µg/g**	**µg/g**
S97T002178	223:1	Lower half	1,390	1,330	1,360
S97T002186	223:2	Lower half	2,710	3,190	2,950
S97T002196	223:3	Lower half	2,200	2,910	2,550[QC:e]
S97T002205	223:4	Lower half	1,390	1,400	1,390
S97T002237	223:5	Lower half	<2820	<2670	<2750
S98T000696	223:6	Whole	5,550	4,560	5,050
S98T000707	223:6A	Whole	4,440	4,220	4,330
S97T002239	223:7	Upper half	8,880	7,510	8,200
S97T002238		Lower half	4,920	4,350	4,630
S97T002241	223:8	Upper half	5,140	4,820	4,980
S97T002240		Lower half	3,450	3,150	3,300
S98T000708	223:9	Whole	1,430	1,450	1,440
S97T002266	223:10	Upper half	8,700	8,220	8,460
S97T002264		Lower half	22,900	26,300	24,600
S97T002321	224:1	Lower half	3,330	3,740	3,530
S98T000725	224:2	Whole	1,610	1,930	1,770
S97T002335	224:3	Lower half	3,910	3,550	3,730
S98T000726	224:4	Whole	1,900	1,800	1,850
S97T002354	224:5	Upper half	3,440	3,740	3,590
S97T002353		Lower half	9,720	9,650	9,680
S97T002356	224:6	Upper half	6,850	7,000	6,920
S97T002355		Lower half	6,630	5,790	6,210
S98T000727	224:7	Whole	5,130	5,090	5,110
S97T002358	224:8	Upper half	7,700	7,720	7,710
S97T002357		Lower half	8,710	6,390	7,550[QC:e]
S97T002393	224:9	Upper half	2,250	3,770	3,010[QC:e]
S97T002388		Lower half	6,830	4,020	5,430[QC:e]
S98T000728	224:10	Whole	3,570	3,540	3,560
S97T002403	224:11	Upper half	2,500	3,130	2,810[QC:e]
S97T002398		Lower half	2,970	4,120	3,550[QC:e]

Table B2-52. Tank 241-SX-106 Analytical Results: Sulfate (IC). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Liquids			μg/mL	μg/mL	μg/mL
S97T002179	223:1	Drainable liquid	5,900	6,120	6,010
S97T002188	223:2	Drainable liquid	5,230	5,400	5,320
S97T002199	223:3	Drainable liquid	4,870	4,950	4,910
S97T002200	223:4	Drainable liquid	4,850	5,690	5,270
S97T002215	223:5	Drainable liquid	5,350	5,290	5,320
S97T002323	224:1	Drainable liquid	4,280	6,330	5,300[QC:e]
S97T002371	224:3	Drainable liquid	5,230	6,410	5,820[QC:e]
S97T002372	224:5	Drainable liquid	5,550	5,080	5,320

Table B2-53. Tank 241-SX-106 Analytical Results: Oxalate (IC). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			μg/g	μg/g	μg/g
S97T002178	223:1	Lower half	<808	<818	<813
S97T002186	223:2	Lower half	<791	<753	<772
S97T002196	223:3	Lower half	<962	<976	<969
S97T002205	223:4	Lower half	1,690	1,310	1,500[QC:e]
S97T002237	223:5	Lower half	4,210	4,390	4,300
S98T000696	223:6	Whole	4,550	3,800	4,180
S98T000707	223:6A	Whole	5,500	5,290	5,390
S97T002239	223:7	Upper half	16,000	14,500	15,300
S97T002238		Lower half	11,400	11,100	11,200
S97T002241	223:8	Upper half	7,400	6,980	7,190
S97T002240		Lower half	5,470	5,020	5,250
S98T000708	223:9	Whole	2,500	2,620	2,560
S97T002266	223:10	Upper half	13,100	13,900	13,500
S97T002264		Lower half	16,200	24,800	20,500[QC:e]
S97T002321	224:1	Lower half	<793	<860	<827
S98T000725	224:2	Whole	<424	<425	<425
S97T002335	224:3	Lower half	<804	<806	<805
S98T000726	224:4	Whole	<426	<433	<429
S97T002354	224:5	Upper half	2,470	2,040	2,250
S97T002353		Lower half	11,900	12,600	12,200
S97T002356	224:6	Upper half	9,930	10,400	10,200
S97T002355		Lower half	11,400	9,790	10,600
S98T000727	224:7	Whole	2,650	4,410	3,530[QC:e]
S97T002358	224:8	Upper half	9,520	9,890	9,700
S97T002357		Lower half	8,630	9,120	8,880
S97T002393	224:9	Upper half	4,040	4,740	4,390
S97T002388		Lower half	11,900	8,080	9,970[QC:e]
S98T000728	224:10	Whole	3,580	3,480	3,530
S97T002403	224:11	Upper half	7,300	8,540	7,920
S97T002398		Lower half	8,270	11,000	9,630[QC:e]

Table B2-53. Tank 241-SX-106 Analytical Results: Oxalate (IC). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Liquids			µg/mL	µg/mL	µg/mL
S97T002179	223:1	Drainable liquid	<541	<541	<541
S97T002188	223:2	Drainable liquid	<541	<541	<541
S97T002199	223:3	Drainable liquid	659	<541	<600
S97T002200	223:4	Drainable liquid	<541	<541	<541
S97T002215	223:5	Drainable liquid	<1,070	<1,070	<1,070
S97T002323	224:1	Drainable liquid	<1,070	1,160	<1,120
S97T002371	224:3	Drainable liquid	<1,070	<1,070	<1,070
S97T002372	224:5	Drainable liquid	<541	902	<721[QC:e]

Table B2-54. Tank 241-SX-106 Analytical Results: Total Inorganic Carbon (TIC). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Triplicate	Mean
Solids			µg/g	µg/g	µg/g	µg/g
S97T002176	223:1	Lower half	1,560	1,590		1,580
S97T002183	223:2	Lower half	3,140	3,570		3,360
S97T002191	223:3	Lower half	1,660	1,520	1,400	1,530[QC:c]
S97T002192	223:4	Lower half	1,960	2,720	2,270	2,320[QC:e]
S97T002218	223:5	Lower half	4,960	4,970		4,970
S98T000692	223:6	Whole	6,350	6,400		6,380
S98T000697	223:6A	Whole	5,350	5,330		5,340
S97T002220	223:7	Upper half	10,300	9,500		9,900
S97T002226		Lower half	6,260	6,280		6,270
S97T002223	223:8	Upper half	8,080	8,090		8,090
S97T002229		Lower half	4,910	4,220		4,570
S98T000698	223:9	Whole	2,390	2,260		2,330
S97T002262	223:10	Upper half	3,440	4,000		3,720
S97T002259		Lower half	5,270	5,210		5,240
S97T002318	224:1	Lower half	2,820	3,030		2,930
S98T000709	224:2	Whole	2,000	2,040		2,020
S97T002333	224:3	Lower half	1,970	1,710		1,840
S98T000710	224:4	Whole	2,280	2,250		2,270
S97T002348	224:5	Upper half	2,510	2,620		2,570
S97T002347		Lower half	10,100	10,200		10,200
S97T002350	224:6	Upper half	9,110	9,550		9,330
S97T002349		Lower half	7,290	7,970		7,630
S98T000711	224:7	Whole	4,410	4,190	4,390	4,330
S97T002352	224:8	Upper half	6,530	6,670		6,600
S97T002351		Lower half	4,500	4,640		4,570
S97T002390	224:9	Upper half	1,880	1,610		1,750
S97T002385		Lower half	1,920	1,990		1,960[QC:c]
S98T000712	224:10	Whole	3,790	3,780		3,790
S97T002400	224:11	Upper half	2,260	2,590		2,430
S97T002395		Lower half	3,150	3,170		3,160

Table B2-54. Tank 241-SX-106 Analytical Results: Total Inorganic Carbon (TIC). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Triplicate	Mean
Liquids			µg/mL	µg/mL	µg/mL	µg/mL
S97T002179	223:1	Drainable liquid	4,790	4,730		4,760
S97T002188	223:2	Drainable liquid	5,120	5,110		5,120
S97T002199	223:3	Drainable liquid	4,800	5,300		5,050
S97T002200	223:4	Drainable liquid	5,340	5,650		5,500
S97T002215	223:5	Drainable liquid	5,290	5,480		5,390
S97T002323	224:1	Drainable liquid	4,670	5,140		4,910
S97T002371	224:3	Drainable liquid	5,180	5,130		5,160
S97T002372	224:5	Drainable liquid	4,980	5,190		5,090

Table B2-55. Tank 241-SX-106 Analytical Results: Total Organic Carbon (TOC). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Triplicate	Mean
Solids			µg/g	µg/g	µg/g	µg/g
S97T002176	223:1	Lower half	1,240	1,260		1,250
S97T002183	223:2	Lower half	2,630	2,860		2,750
S97T002191	223:3	Lower half	1,360	1,220	1,110	1,230[QC:e]
S97T002192	223:4	Lower half	1,250	2,030	1,560	1,610[QC:e]
S97T002218	223:5	Lower half	3,640	3,560		3,600
S98T000692	223:6	Whole	2,450	2,430		2,440
S98T000697	223:6A	Whole	2,570	2,750		2,660
S97T002220	223:7	Upper half	6,370	6,450		6,410
S97T002226		Lower half	5,040	4,870		4,960
S97T002223	223:8	Upper half	4,450	4,630		4,540
S97T002229		Lower half	2,930	3,080		3,010
S98T000698	223:9	Whole	1,980	2,830		2,410[QC:e]
S97T002262	223:10	Upper half	3,230	3,540		3,390
S97T002259		Lower half	4,000	3,990		4,000
S97T002318	224:1	Lower half	2,720	2,310		2,520
S98T000709	224:2	Whole	1,590	1,570		1,580
S97T002333	224:3	Lower half	1,410	1,270		1,340
S98T000710	224:4	Whole	1,410	1,490		1,450
S97T002348	224:5	Upper half	1,830	1,740		1,790
S97T002347		Lower half	6,170	5,790		5,980
S97T002350	224:6	Upper half	6,410	6,030		6,220
S97T002349		Lower half	6,110	6,640		6,380
S98T000711	224:7	Whole	2,150	3,350	2,040	2,510[QC:e]
S97T002352	224:8	Upper half	5,030	4,870		4,950
S97T002351		Lower half	3,880	3,970		3,930
S97T002390	224:9	Upper half	2,600	2,130		2,370
S97T002385		Lower half	3,000	2,610		2,810
S98T000712	224:10	Whole	2,240	3,440	2,260	2,650[QC:e]
S97T002400	224:11	Upper half	3,600	2,810		3,210[QC:e]
S97T002395		Lower half	3,810	3,860		3,840

Table B2-55. Tank 241-SX-106 Analytical Results: Total Organic Carbon (TOC). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Triplicate	Mean
Liquids			µg/mL	µg/mL	µg/mL	µg/mL
S97T002179	223:1	Drainable liquid	3,840	3,860		3,850
S97T002188	223:2	Drainable liquid	3,870	3,850		3,860
S97T002199	223:3	Drainable liquid	3,680	4,060		3,870
S97T002200	223:4	Drainable liquid	4,120	4,370		4,250
S97T002215	223:5	Drainable liquid	4,430	4,560		4,500
S97T002323	224:1	Drainable liquid	3,870	4,110		3,990
S97T002371	224:3	Drainable liquid	4,090	4,080		4,090
S97T002372	224:5	Drainable liquid	3,970	4,080		4,030

Table B2-56. Tank 241-SX-106 Analytical Results: Total Organic Carbon (TOC).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			µg/g	µg/g	µg/g
S97T002403	224:11	Upper half	8,730	6,730	7,730[QC:e]

Table B2-57. Tank 241-SX-106 Analytical Results: Total Alpha.

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion			µCi/g	µCi/g	µCi/g
S97T002177	223:1	Lower half	<0.00939	<0.00779	<0.00859[QC:c]
S97T002185	223:2	Lower half	<0.016	<0.0118	<0.0139[QC:e]
S97T002194	223:3	Lower half	<0.0129	<0.0156	<0.0143[QC:c]
S97T002204	223:4	Lower half	<0.0243	0.0238	<0.0241
S97T002231	223:5	Lower half	0.0456	0.0483	0.047[QC:f]
S98T000694	223:6	Whole	0.12	0.132	0.126
S98T000703	223:6A	Whole	0.181	0.194	0.188
S97T002232	223:7	Lower half	0.409	0.441	0.425
S97T002234	223:8	Lower half	0.0955	0.0744	0.085[QC:e]
S98T000704	223:9	Whole	0.155	0.167	0.161
S97T002263	223:10	Lower half	0.498	0.469	0.484
S97T002320	224:1	Lower half	<0.0092	<0.00893	<0.00907
S98T000717	224:2	Whole	0.00901	0.0102	0.00961
S97T002334	224:3	Lower half	<0.00884	<0.00893	<0.00889
S98T000718	224:4	Whole	<0.00525	<0.00442	<0.00484
S97T002359	224:5	Lower half	0.311	0.352	0.332
S97T002361	224:6	Lower half	0.367	0.429	0.398
S98T000719	224:7	Whole	0.122	0.129	0.126
S97T002363	224:8	Lower half	0.51	0.472	0.491
S97T002387	224:9	Lower half	1.27	1.25	1.26
S98T000720	224:10	Whole	0.431	0.369	0.4
S97T002397	224:11	Lower half	0.618	0.578	0.598
Liquids			µCi/mL	µCi/mL	µCi/mL
S97T002179	223:1	Drainable liquid	0.00473	<0.00317	<0.00395[QC:c,f]
S97T002188	223:2	Drainable liquid	<0.00317	<0.00317	<0.00317[QC:f]
S97T002199	223:3	Drainable liquid	0.00286	0.00473	0.0038[QC:c,f]
S97T002200	223:4	Drainable liquid	<0.00655	<0.004	<0.00528
S97T002215	223:5	Drainable liquid	<0.00174	<0.00232	<0.00203

Table B2-58. Tank 241-SX-106 Analytical Results: Exotherms - Calculated Dry Weight (DSC).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids			**J/g DW**	**J/g DW**	**J/g DW**
S97T002347	224:5	Lower half	29.2	49.4	39.3[QC:e]
S97T002350	224:6	Upper half	123	126	125
S97T002349		Lower half	137	142	140
S97T002400	224:11	Upper half	280	258	269
Liquids			**J/g DW**	**J/g DW**	**J/g DW**
S97T002199	223:3	Drainable liquid	15.2	15.5	15.3

Table B2-59. Tank 241-SX-106 Analytical Results: Exotherm - Transition 1 (DSC/TGA).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids			**J/g**	**J/g**	**J/g**
S97T002347	224:5	Lower half	16.2	27.5	21.9[QC:e]
S97T002350	224:6	Upper half	70.5	72.4	71.4
S97T002349		Lower half	77.4	80.4	78.9
S97T002400	224:11	Upper half	155	143	149
Liquids			**J/g**	**J/g**	**J/g**
S97T002199	223:3	Drainable liquid	7.4	7.55	7.47

Table B2-60. Tank 241-SX-106 Analytical Results: Percent Water (DSC/TGA). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Triplicate	Mean
Solids			%	%	%	%
S97T002176	223:1	Lower half	36.5	34.7		35.6
S97T002183	223:2	Lower half	51.4	49.5		50.4
S97T002191	223:3	Lower half	28.8	37.2		33
S97T002192	223:4	Lower half	37.7	35.5		36.6
S97T002218	223:5	Lower half	48.2	48.6		48.4
S98T000692	223:6	Whole	67	66		66.5
S98T000697	223:6A	Whole	66.8	67.5		67.2
S97T002220	223:7	Upper half	42.2	41.9		42
S97T002226		Lower half	42.2	42.3		42.3
S97T002223	223:8	Upper half	42.7	45.5		44.1
S97T002229		Lower half	37.3	41.3		39.3
S98T000698	223:9	Whole	62	61.7		61.9
S97T002262	223:10	Upper half	21.6	23		22.3
S97T002259		Lower half	21.6	26.9		24.3
S97T002318	224:1	Lower half	50	49.4		49.7
S98T000709	224:2	Whole	70.3	69.5		69.9
S97T002333	224:3	Lower half	48.8	48.8		48.8
S98T000710	224:4	Whole	68.4	66.3		67.4
S97T002348	224:5	Upper half	48.7	48.9		48.8
S97T002347		Lower half	43.5	45.2		44.3
S97T002350	224:6	Upper half	42.7	43.1		42.9
S97T002349		Lower half	43.1	43.9		43.5
S98T000711	224:7	Whole	55.9	62		59
S97T002352	224:8	Upper half	35.5	35.3		35.4
S97T002351		Lower half	26.1	31.1		28.6
S97T002390	224:9	Upper half	35.6	24.5	30.3	30.1[QC:e]
S97T002385		Lower half	30	31.6		30.8
S98T000712	224:10	Whole	56.2	54.9		55.6
S97T002400	224:11	Upper half	46.1	42.9		44.5
S97T002395		Lower half	31	31.6		31.3

Table B2-60. Tank 241-SX-106 Analytical Results: Percent Water (DSC/TGA). (2 sheets)

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Triplicate	Mean
Liquids			%	%	%	%
S97T002179	223:1	Drainable liquid	19.3	22.4		20.9
S97T002179RR1		Drainable liquid	31	35.1		33
S97T002188	223:2	Drainable liquid	51	50.8		50.9
S97T002199	223:3	Drainable liquid	51.2	51.2		51.2
S97T002200	223:4	Drainable liquid	51.5	51.5		51.5
S97T002215	223:5	Drainable liquid	49.8	49.9		49.8
S97T002323	224:1	Drainable liquid	51.1	49.6		50.3
S97T002371	224:3	Drainable liquid	51.2	51.1		51.1
S97T002372	224:5	Drainable liquid	50.3	49.2		49.8

Table B2-61. Tank 241-SX-106 Analytical Results: Bulk Density.

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids			g/mL	g/mL	g/mL
S97T002175	223:1	Lower half	1.53	NA	1.53
S97T002182	223:2	Lower half	1.42	NA	1.42
S97T002190	223:3	Lower half	1.5	NA	1.5
S97T002193	223:4	Lower half	1.56	NA	1.56
S97T002217	223:5	Lower half	1.44	NA	1.44
S97T002236	223:6	Whole	1.3	NA	1.3
S97T002242	223:6A	Whole	1.32	NA	1.32
S97T002225	223:7	Lower half	1.69	NA	1.69
S97T002228	223:8	Lower half	1.69	NA	1.69
S97T002251	223:9	Whole	1.35	NA	1.35
S97T002258	223:10	Lower half	1.79	NA	1.79
S97T002317	224:1	Lower half	1.56	NA	1.56
S97T002310	224:2	Whole	1.24	NA	1.24
S97T002331	224:3	Lower half	1.61	NA	1.61
S97T002327	224:4	Whole	1.25	NA	1.25
S97T002336	224:5	Lower half	1.59	NA	1.59
S97T002338	224:6	Lower half	1.68	NA	1.68
S97T002374	224:7	Whole	1.28	NA	1.28
S97T002340	224:8	Lower half	1.68	NA	1.68
S97T002384	224:9	Lower half	1.72	NA	1.72
S97T002376	224:10	Whole	1.3	NA	1.3
S97T002394	224:11	Lower half	1.65	NA	1.65

Table B2-62. Tank 241-SX-106 Analytical Results: Specific Gravity.

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Liquids			unitless	unitless	unitless
S97T002179	223:1	Drainable liquid	1.4	1.4	1.4
S97T002188	223:2	Drainable liquid	1.4	1.41	1.4
S97T002199	223:3	Drainable liquid	1.4	1.41	1.4
S97T002200	223:4	Drainable liquid	1.4	1.4	1.4
S97T002215	223:5	Drainable liquid	1.41	1.45	1.43
S97T002323	224:1	Drainable liquid	1.5	1.41	1.45
S97T002371	224:3	Drainable liquid	1.41	1.4	1.41
S97T002372	224:5	Drainable liquid	1.42	1.44	1.43

B3.0 ASSESSMENT OF CHARACTERIZATION RESULTS

This section discusses the overall quality and consistency of the current sampling results for tank 241-SX-106 and provides the results of an analytical-based inventory calculation.

This section also evaluates sampling and analysis factors that may impact data interpretation. These factors are used to assess overall data quality and consistency and to identify limitations in data use.

B3.1 FIELD OBSERVATIONS

Two cores, 11 segments each, were expected from this tank during the 1997 core sampling event. Selected segments from core 223 (6, 6A, 9, and 11) and core 224 (2, 4, 7, and 10) were sampled using the RGS. Sample x-rays were taken for retained gas samples. While retrieving segment 11 of core 223, the grapple cable broke, requiring the drill string and sampler to be removed manually. The x-rays of the sampler indicated that it contained lithium bromide solution and air with no sample material present. Therefore, laboratory analyses were not performed on this segment.

B3.2 QUALITY CONTROL ASSESSMENT

The usual quality control assessment includes an evaluation of the appropriate standard recoveries, spike recoveries, duplicate analyses, and blanks that are performed in conjunction with the chemical analyses. Sample and duplicate pairs with one or more quality control results outside the specified criteria were identified by footnotes in the data summary tables (see Section B2.0).

The standard and spike recovery results provide an estimate of the accuracy of the analysis. If a standard or spike recovery is above or below the given criterion, the analytical results may be biased high or low, respectively. The precision is estimated by the RPD, which is defined as the absolute value of the difference between the primary and duplicate samples, divided by their mean, times 100.

All of the pertinent quality control tests were conducted on the 1997 core samples, allowing a full assessment regarding the accuracy and precision of the data. The specific criteria for the analytes required by the safety screening DQO were given in the SAP (Jo 1997), whereas the criteria governing the opportunistic analytes were given in DOE (1997).

The RPD for one of the 39 subsamples was outside the specified acceptance limits for DSC. The heterogeneous material and the small sample size required for these analyses made it difficult to obtain reproducible results. No resampling was requested. The standard recoveries for this analysis were within the required limits.

The RPD for one of the 39 subsamples analyzed for TGA exceeded the acceptance limit. A triplicate analysis was performed. The standard recoveries for this analysis were within the required limits.

Of the 34 ICP analytes, only lithium was a DQO requirement. The standard recoveries, RPDs, and spike recoveries for the lithium analysis were within the required limits.

Of the eight anions analyzed by IC, only bromide was a DQO required analyte. The standard recoveries, RPDs, and spike recoveries for the bromide analysis were within the required limits.

High RPDs were reported for five subsamples analyzed for TOC by persulfate. Selected subsamples had resampling or triplicate analyses performed. The results of the reanalyses showed little improvement in RPDs. A spike recovery below the quality control range was reported for one sample, which was attributed to the high concentration of this analyte in the sample with respect to the amount of spike standard added. No reanalysis was requested. The standard recoveries for this analysis were within the required limits.

A high RPD was reported for one sample analyzed for TOC by furnace oxidation. This was attributed to sample heterogeneity. No resampling was requested. The standard recovery and spike recovery was within the required limits.

High RPDs were reported for two of the 28 subsamples submitted for total alpha activity analyses. The sample results were near the detection limit, which decreased the precision of the analyses. No resamplings were requested because of the low alpha activity in the samples. Spike recoveries below the quality control range were reported for two subsamples. The spike recoveries were within the laboratory statistical control limits for the quality control standard, and no resamplings were requested. The preparation blanks for some samples showed a small amount of alpha contamination. The levels of these contaminants were inconsequential when compared to the results of the samples. These contaminants did not impact sample data quality. The standard recoveries for this analysis were within the required limits.

In summary, the quality control results were excellent, and the few minor discrepancies mentioned here and footnoted in the data summary tables should not impact either the validity or the use of the data.

B3.3 DATA CONSISTENCY CHECKS

This section assesses the data consistency and quality from the tank 241-SX-106 core samples. Comparisons of different analytical methods can help to assess the consistency and quality of the data. In addition, mass and charge balances were calculated for both the supernatant and sludge layers to help assess the overall data consistency.

B3.3.1 Comparison of Results from Different Analytical Methods

The following data consistency checks compare the results from two analytical methods. Close agreement between the two methods strengthens the credibility of both results, but poor agreement brings the reliability of the data into question. All analytical mean results were taken from the Section B2.0 tables.

A comparison was possible between the supernatant phosphorus and sulfur as analyzed by ICP with phosphate and sulfate as analyzed by IC. No other comparisons were possible because of nondetected values.

The supernatant analytical phosphorus mean result as determined by ICP was 1,150 μg/mL, which converts to 3,520 μg/mL of phosphate. This compares well with the IC phosphate mean result of 3,220 μg/mL. The RPD between these two phosphate results was 9.0 percent. The supernatant analytical sulfur mean result as determined by ICP was 2,400 μg/mL, which converts to 7,180 μg/mL of sulfate. This compares with the IC sulfate mean result of 5,410 μg/mL. The RPD between these two sulfate results was 28.2 percent.

B3.3.2 Mass and Charge Balance

The principal objective in performing mass and charge balances is to determine whether the measurements are consistent. Separate mass and charge balances were calculated for the supernatant and sludge layers because these waste phases were analyzed separately. The results of these comparisons are presented in Sections B3.3.2.1 and B3.3.2.2.

B3.3.2.1 Solids Mass and Charge Balance. In calculating the mass and charge balances for the sludge layer, only those analytes listed in Table 3-7 that were detected at a concentration of 1,000 μg/g or greater were considered. With the exception of sodium, all cations listed in Table B3-1 were assumed to be in their most common hydroxide or oxide form, and the concentrations of the assumed species were calculated stoichiometrically. Because precipitates are neutral species, all positive charge was attributed to the sodium cation. Aluminum is assumed to be present as aluminate. The anions listed in Table B3-2 were assumed to be present as sodium salts and were expected to balance the positive charge exhibited by the sodium. The carbonate value was derived from the TIC analyses. The acetate data was derived from the TOC analyses. Phosphate and sulfate, as determined by IC, are assumed to be completely water soluble and appear only in the anion mass and charge calculations. Because oxalate was assumed to be adequately accounted for in the TOC concentration, it was not included separately in the mass balance. The concentrations of cationic species in Table B3-1, the anionic species in Table B3-2, and the percent water were ultimately used to calculate the mass balance.

The mass balance was calculated from the formula below. The factor 0.0001 is the conversion factor from μg/g to weight percent.

Mass balance = Percent water + 0.0001 x {Total Analyte Concentration}

= Percent water + 0.0001 x $\{Cr(OH)_3 + Na^+ + AlO_2^- + CO_3^{2-} + C_2H_3O_2^- + Cl^- + NO_3^- + NO_2^- + PO_4^{3-} + SO_4^{2-}\}$

The total analyte concentrations calculated from the above equation is 652,000 μg/g. The mean weight percent water is 39.8 percent or 398,000 μg/g. The mass balance resulting from adding the percent water to the total analyte concentration is 105 percent (see Table B3-3).

The following equations demonstrate the derivation of total cations and total anions; the charge balance is the ratio of these two values.

Total cations (μeq/g) = $[Na^+]/23.0$ = 8,130 μeq/g

Total anions (μeq/g) = $[AlO_2^-]/59.0 + [CO_3^{2-}]/30.0 + [C_2H_3O_2^-]/59.0 + [Cl^-]/35.4 + [NO_3^-]/62.0 + [NO_2^-]/46.0 + [PO_4^{3-}]/31.7 + [SO_4^{2-}]/48.1$ = 8,520 μeq/g

The charge balance obtained by dividing the sum of the positive charge by the sum of the negative charge was 0.95. There is a net negative charge of 390 μeq/g.

In summary, the above calculations yield reasonable mass and charge balance values (close to 1.00 for charge balance and 100 percent for mass balance), indicating that the analytical results are generally self-consistent.

Table B3-1. Sludge Cation Mass and Charge Data.

Analyte	Concentration (μg/g)	Assumed Species	Concentration of Assumed Species (μg/g)	Charge (μeq/g)
Chromium	3,790	$Cr(OH)_3$	7,510	0
Sodium	1.87E+05	Na^+	1.87E+05	8,130
Total			1.95E+05	8,130

Table B3-2. Sludge Anion Mass and Charge Data.

Analyte	Concentration (μg/g)	Assumed Species	Concentration of Assumed Species (μg/g)	Charge (μeq/g)
Aluminum	19,600	AlO_2^-	42,800	726
TIC	4,440	CO_3^{2-}	22,200	740
TOC	3,570	$C_2H_3O_2^-$	8,780	149
Chloride	6,550	Cl^-	6,550	185
Nitrate	2.86E+05	NO_3^-	2.86E+05	4,610
Nitrite	71,700	NO_2^-	71,700	1,560
Phosphate	13,900	PO_4^{3-}	13,900	439
Sulfate	5,390	SO_4^{2-}	5,390	112
Total			4.57E+05	8,521

Table B3-3. Sludge Mass and Charge Balance Totals.

Totals	Concentrations (μg/g)	Charge (μeq/g)
Total from Table B3-2 (cations)	1.95E+05	8,130
Total from Table B3-3 (anions)	4.57E+05	8,520
Water percent	3.98E+05	0
Total	1.05E+05	-390

B3.3.2.2 Supernatant Mass and Charge Balance. In calculating the mass and charge balances for the supernatant layer, only those analytes listed in Table 3-8 that were detected at a concentration of 1,000 μg/g or greater were considered. All analytical results were first converted from μg/mL to μg/g (using the supernatant specific gravity mean of 1.42) before use in the tables. Because this portion of the tank is supernatant, the cations listed in Table B3-4 and the anions listed in Table B3-5 were all assumed to be present as ions, with the exception of aluminum. Aluminum is assumed to be present as aluminate. The carbonate data were derived from the TIC analyses. The acetate data were derived from the TOC analyses. Phosphate and sulfate, as determined by IC, are assumed to be completely water soluble and appear only in the anion mass and charge calculations. The concentrations of cationic species in Table B3-4, the anionic species in Table B3-5, and the percent water were ultimately used to calculate the mass balance.

The mass balance was calculated from the formula below. The factor 0.0001 is the conversion factor from μg/g to weight percent.

Mass balance = Percent water + 0.0001 x {Total Analyte Concentration}

= Percent water + 0.0001 x $\{K^+ + Na^+ + AlO_2^- + CO_3^{2-} + C_2H_3O_2^- + Cl^- + NO_3^- + NO_2^- + PO_4^{3-} + SO_4^{2-}\}$

The total analyte concentrations calculated from the above equation is 492,000 μg/g. The mean weight percent water is 47.6 percent or 476,000 μg/g. The mass balance resulting from adding the percent water to the total analyte concentration is 96.8 percent (see Table B3-6).

The following equations demonstrate the derivation of total cations and total anions; the charge balance is the ratio of these two values.

Total cations (μeq/g) = $[K^+]/39.1 + [Na^+]/23.0 = 7{,}570$ μeq/g

Total anions (μeq/g) = $[AlO_2^-]/59.0 + [CO_3^{2-}]/30.0 + [C_2H_3O_2^-]/59.0 + [Cl^-]/35.4 + [NO_3^-]/62.0 + [NO_2^-]/46.0 + [PO_4^{3-}]/31.7 + [SO_4^{2-}]/48.1 = 6{,}140$ μeq/g

The charge balance obtained by dividing the sum of the positive charge by the sum of the negative charge was 1.23. This is a net positive charge of 1,430 μeq/g. Assuming that this net positive charge is a result of the omission of hydroxide, this would equate to 24,400 μg/g of hydroxide in the supernatant. The corrected mass balance with the inclusion of hydroxide is 99.2 percent.

In summary, the above calculations and assumptions yield reasonable mass and charge balance values (close to 1.00 for charge balance and 100 percent for mass balance), indicating that the analytical results are generally self-consistent.

Table B3-4. Supernatant Cation Mass and Charge Data.

Analyte	Concentration (μg/g)	Assumed Species	Concentration of Assumed Species (μg/g)	Charge (μeq/g)
Potassium	2,740	K^+	2,740	70
Sodium	1.72E+05	Na^+	1.72E+05	7,500
Total			1.75E+05	7,570

Table B3-5. Supernatant Anion Mass and Charge Data.

Analyte	Concentration ($\mu g/g$)	Assumed Species	Concentration of Assumed Species ($\mu g/g$)	Charge ($\mu eq/g$)
Aluminum	18,200	AlO_2^-	39,900	676
TIC	3,610	CO_3^{2-}	18,000	601
TOC	2,850	$C_2H_3O_2^-$	7,010	119
Chloride	8,240	Cl^-	8,240	233
Nitrate	1.46E+05	NO_3^-	1.46E+05	2,350
Nitrite	92,200	NO_2^-	92,200	2,010
Phosphate	2,270	PO_4^{3-}	2,270	72
Sulfate	3,810	SO_4^{2-}	3,810	79
Total			3.17E+05	6,140

Table B3-6. Supernatant Mass and Charge Balance Totals.

Totals	Concentrations ($\mu g/g$)	Charge ($\mu eq/g$)
Total from Table B3-4 (cations)	1.75E+05	7,570
Total from Table B3-5 (anions)	3.17E+05	6,140
Water percent	4.76E+05	0
Subtotal	9.68E+05	+1,430
Hydroxide assumed from charge balance	24,300	-1,430
Total	9.92E+05	0

B3.4 MEAN CONCENTRATIONS AND CONFIDENCE INTERVALS

B3.4.1 Solid Data

A nested analysis of variance (ANOVA) model was fit to the core segment data. Mean values, and 95 percent confidence intervals on the mean, were determined from the ANOVA. Four variance components were used in the calculations. The variance components represent concentration differences between risers, segments, laboratory samples, and analytical replicates. The model is:

$$Y_{ijk} = \mu + R_i + S_{ij} + L_{ijk} + A_{ijkm},$$

$$I=1,2,\ldots,a;\ j=1,2,\ldots,b_i;\ k=1,2,\ldots,c_{ij};m=1,2,\ldots,n_{ijk}$$

where:

Y_{ijk}	=	concentration from the m^{th} analytical result of the k^{th} sample of the j^{th} segment of the i^{th} riser
μ	=	the mean
R_i	=	the effect of the i^{th} riser
S_{ij}	=	the effect of the j^{th} segment from the i^{th} riser
L_{ijk}	=	the effect of the k^{th} sample from the j^{th} segment of the i^{th} riser
A_{ijkm}	=	the analytical error
a	=	the number of risers
b_i	=	the number of segments from the i^{th} riser
c_{ij}	=	the number of samples from the j^{th} segment of the i^{th} riser
n_{ijk}	=	the number of analytical results from the ijk^{th} sample.

The variables R_i, S_{ij}, and L_{ijk} are random effects. These variables, as well as A_{ijkm}, are assumed to be uncorrelated and normally distributed with means zero and variances $\sigma^2(R)$, $\sigma^2(S)$, $\sigma^2(L)$ and $\sigma^2(A)$, respectively.

The restricted maximum likelihood method (REML) was used to estimate the mean concentration and standard deviation of the mean for all analytes that had 50 percent or more of their reported values greater than the detection limit. The mean value and standard deviation of the mean were used to calculate the 95 percent confidence intervals. Table B3-7 gives the mean, degrees of freedom, and confidence interval for each constituent. The statistical results were obtained using the statistical analysis package S-PLUS[1] (Statistical Sciences 1993).

[1]S-PLUS is a registered trademark of Statistical Sciences, Seattle, Washington.

A 300-mL solution of isotopically labeled ammonium hydroxide was added to the RGS waste samples to aid in ammonia determination. Because this additional liquid in the samples may bias the analytical results, the results from the RGS samples were not included in the derivation of the statistical means.

Some analytes had results that were below the detection limit. In these cases the value of the detection limit was used for nondetected results. For analytes with a majority of results below the detection limit, a simple average is all that is reported. For those analytes with less-than values, including the detection limit in the computation of the mean may bias the result high.

The lower and upper limits, LL(95%) and UL(95%), of a two-sided 95 percent confidence interval on the mean were calculated using the following equation:

$$LL(95\%) = \hat{\mu} - t_{(df,\ 0.025)} \times \hat{\sigma}(\hat{\mu}),$$
$$UL(95\%) = \hat{\mu} + t_{(df,\ 0.025)} \times \hat{\sigma}(\hat{\mu}).$$

In this equation, $\hat{\mu}$ is the restricted maximum likelihood method estimate of the mean concentration, $\hat{\sigma}(\hat{\mu})$ is the restricted maximum likelihood method estimate of the standard deviation of the mean, and $t_{(df,\ 0.025)}$ is the quantile from Student's t distribution with *df* degrees of freedom. The degrees of freedom equals the number of risers with data minus one. In cases where the lower limit of the confidence interval was negative, it is reported as zero.

Table B3-7. Tank 241-SX-106 95 Percent Two-Sided Confidence Interval for the Mean Concentration for Solid Segment Data. (3 sheets)

Analyte	Method	Mean	*df*	LL	UL	Units
Aluminum	ICP:F	1.96E+04	1	0.00E+00	5.67E+04	μg/g
Antimony[1]	ICP:F	<1.19E+03	n/a	n/a	n/a	μg/g
Arsenic[1]	ICP:F	<1.99E+03	n/a	n/a	n/a	μg/g
Barium[1]	ICP:F	<9.92E+02	n/a	n/a	n/a	μg/g
Beryllium[1]	ICP:F	<9.92E+01	n/a	n/a	n/a	μg/g
Bismuth[1]	ICP:F	<1.99E+03	n/a	n/a	n/a	μg/g
Boron[1]	ICP:F	<9.92E+02	n/a	n/a	n/a	μg/g
Bromide[1]	IC:W	<1.38E+03	n/a	n/a	n/a	μg/g
Cadmium[1]	ICP:F	<9.92E+01	n/a	n/a	n/a	μg/g
Calcium[1]	ICP:F	<1.99E+03	n/a	n/a	n/a	μg/g
Cerium[1]	ICP:F	<1.99E+03	n/a	n/a	n/a	μg/g
Chloride	IC:W	6.55E+03	1	0.00E+00	1.47E+04	μg/g

Table B3-7. Tank 241-SX-106 95 Percent Two-Sided Confidence Interval for the Mean Concentration for Solid Segment Data. (3 sheets)

Analyte	Method	Mean	*df*	LL	UL	Units
Chromium[1]	ICP:F	3.79E+03	1	0.00E+00	1.73E+04	μg/g
Cobalt[1]	ICP:F	<3.97E+02	n/a	n/a	n/a	μg/g
Copper[1]	ICP:F	<1.99E+02	n/a	n/a	n/a	μg/g
Fluoride[1]	IC:W	5.30E+02	1	0.00E+00	3.48E+03	μg/g
Gross alpha[1]	Alpha:F	2.88E-01	1	0.00E+00	2.22E+00	μCi/g
Iron[1]	ICP:F	<1.23E+03	n/a	n/a	n/a	μg/g
Lanthanum[1]	ICP:F	<9.92E+02	n/a	n/a	n/a	μg/g
Lead[1]	ICP:F	<1.99E+03	n/a	n/a	n/a	μg/g
Lithium[1]	ICP:F	<1.99E+02	n/a	n/a	n/a	μg/g
Magnesium[1]	ICP:F	<1.99E+03	n/a	n/a	n/a	μg/g
Manganese[1]	ICP:F	3.56E+02	1	0.00E+00	1.71E+03	μg/g
Molybdenum[1]	ICP:F	<9.92E+02	n/a	n/a	n/a	μg/g
Neodymium[1]	ICP:F	<1.99E+03	n/a	n/a	n/a	μg/g
Nitrate[1]	IC:W	2.86E+05	1	0.00E+00	1.35E+06	μg/g
Nitrite	IC:W	7.17E+04	1	0.00E+00	1.65E+05	μg/g
Oxalate[1]	IC:W	6.44E+03	1	0.00E+00	2.34E+04	μg/g
Percent water	DSC/TGA	3.98E+01	1	1.30E+01	6.66E+01	%
Phosphate	IC:W	1.39E+04	1	0.00E+00	3.62E+04	μg/g
Phosphorus[1]	ICP:F	<5.06E+03	n/a	n/a	n/a	μg/g
Samarium[1]	ICP:F	<1.99E+03	n/a	n/a	n/a	μg/g
Silicon[1]	ICP:F	<1.06E+03	n/a	n/a	n/a	μg/g
Silver[1]	ICP:F	<1.99E+02	n/a	n/a	n/a	μg/g
Sodium	ICP:F	1.87E+05	1	1.22E+05	2.52E+05	μg/g
Strontium[1]	ICP:F	<1.99E+02	n/a	n/a	n/a	μg/g
Sulfate[1]	IC:W	5.39E+03	1	0.00E+00	1.90E+04	μg/g
Sulfur[1]	ICP:F	<2.22E+03	n/a	n/a	n/a	μg/g
Thallium[1]	ICP:F	<3.97E+03	n/a	n/a	n/a	μg/g
Titanium[1]	ICP:F	<1.99E+02	n/a	n/a	n/a	μg/g
TIC	TIC/TOC	4.44E+03	1	0.00E+00	1.26E+04	μg/g
TOC	TIC/TOC	3.57E+03	1	0.00E+00	7.98E+03	μg/g

Table B3-7. Tank 241-SX-106 95 Percent Two-Sided Confidence Interval for the Mean Concentration for Solid Segment Data. (3 sheets)

Analyte	Method	Mean	*df*	LL	UL	Units
TOC	Furnace oxidation	7.73E+03	1	0.00E+00	2.04E+04	μg/g
Uranium[1]	ICP:F	<9.92E+03	n/a	n/a	n/a	μg/g
Vanadium[1]	ICP:F	<9.92E+02	n/a	n/a	n/a	μg/g
Zinc[1]	ICP:F	<1.99E+02	n/a	n/a	n/a	μg/g
Zirconium[1]	ICP:F	<1.99E+02	n/a	n/a	n/a	μg/g

Note:

[1]A "less than" value was used in the calculation.

B3.4.2 Liquid Data

The model fit to the liquid data was a nested ANOVA model. The model determined the mean value, and 95 percent confidence interval, for each constituent. Two variance components were used in the calculations. The variance components represent concentration differences between samples taken from different riser and between analytical replicates. The model is:

$$Y_{ijk} = \mu + R_i + A_{ij},$$

$$I=1,2,\ldots,a;\ j=1,2,\ldots,n_i;$$

where

Y_{ijk} = concentration from the kth analytical result of the jth sample from the ith segment

μ = the mean

R_i = the effect of the ith riser

A_{ij} = the analytical error

a = the number of segments

n_i = the number of analytical results from the ith riser.

The variable R_i is a random effect. This variable, along with A_{ij}, is assumed to be uncorrelated and normally distributed with means zero and variances $\sigma^2(R)$ and $\sigma^2(A)$, respectively. Table B3-8 gives the mean, degrees of freedom, and confidence interval for each constituent. The degrees of freedom associated with the standard deviation of the mean is the number of risers with data minus one.

A 300-mL solution of isotopically labeled ammonium hydroxide was added to the RGS waste samples to aid in ammonia determination. Because this additional liquid in the samples may bias the analytical results, the results from the RGS samples were not included in the derivation of the statistical means.

Table B3-8. Tank 241-SX-106 95 Percent Two-Sided Confidence Interval for the Mean Concentration for Liquid Subdivision Data. (2 sheets)

Analyte	Method	Mean	*df*	LL	UL	Units
Aluminum	ICP	2.59E+04	1	1.94E+04	3.24E+04	µg/mL
Antimony[1]	ICP	<3.61E+01	n/a	n/a	n/a	µg/mL
Arsenic[1]	ICP	<6.01E+01	n/a	n/a	n/a	µg/mL
Barium[1]	ICP	<3.01E+01	n/a	n/a	n/a	µg/mL
Beryllium[1]	ICP	<3.00E+00	n/a	n/a	n/a	µg/mL
Bismuth[1]	ICP	<6.01E+01	n/a	n/a	n/a	µg/mL
Boron	ICP	9.34E+01	1	7.57E+01	1.11E+02	µg/mL
Bromide[1]	IC	1.03E+03	1	0.00E+00	2.46E+03	µg/mL
Cadmium[1]	ICP	<3.00E+00	n/a	n/a	n/a	µg/mL
Calcium[1]	ICP	<6.01E+01	n/a	n/a	n/a	µg/mL
Cerium[1]	ICP	<6.01E+01	n/a	n/a	n/a	µg/mL
Chloride	IC	1.17E+04	1	9.30E+03	1.42E+04	µg/mL
Chromium	ICP	1.29E+02	1	8.55E+01	1.73E+02	µg/mL
Cobalt[1]	ICP	<1.20E+01	n/a	n/a	n/a	µg/mL
Copper[1]	ICP	<6.01E+00	n/a	n/a	n/a	µg/mL
Fluoride[1]	IC	3.11E+02	1	0.00E+00	1.33E+03	µg/mL
Gross alpha[1]	Alpha	<3.64E-03	n/a	n/a	n/a	µCi/mL
Iron[1]	ICP	<3.01E+01	n/a	n/a	n/a	µg/mL
Lanthanum[1]	ICP	<3.01E+01	n/a	n/a	n/a	µg/mL
Lead[1]	ICP	<6.01E+01	n/a	n/a	n/a	µg/mL
Lithium[1]	ICP	8.07E+00	1	0.00E+00	2.47E+01	µg/mL
Magnesium[1]	ICP	<6.01E+01	n/a	n/a	n/a	µg/mL

Table B3-8. Tank 241-SX-106 95 Percent Two-Sided Confidence Interval for the Mean Concentration for Liquid Subdivision Data. (2 sheets)

Analyte	Method	Mean	*df*	LL	UL	Units
Manganese[1]	ICP	<6.01E+00	n/a	n/a	n/a	μg/mL
Molybdenum	ICP	1.27E+02	1	1.06E+02	1.48E+02	μg/mL
Neodymium[1]	ICP	<6.01E+01	n/a	n/a	n/a	μg/mL
Nickel[1]	ICP	<1.20E+01	n/a	n/a	n/a	μg/mL
Nitrate	IC	2.07E+05	1	3.86E+04	3.75E+05	μg/mL
Nitrite	IC	1.31E+05	1	7.96E+04	1.83E+05	μg/mL
Oxalate[1]	IC	<7.75E+02	n/a	n/a	n/a	μg/mL
Percent H_2O	DSC/TGA	4.76E+01	1	8.27E+00	8.68E+01	%
Phosphate	IC	3.22E+03	1	7.20E+02	5.72E+03	μg/mL
Phosphorus	ICP	1.15E+03	1	4.75E+02	1.82E+03	μg/mL
Potassium	ICP	3.89E+03	1	3.14E+03	4.65E+03	μg/mL
Samarium[1]	ICP	<6.01E+01	n/a	n/a	n/a	μg/mL
Silicon	ICP	8.57E+01	1	0.00E+00	4.33E+02	μg/mL
Silver	ICP	1.75E+01	1	1.34E+01	2.15E+01	μg/mL
Sodium	ICP	2.45E+05	1	1.92E+05	2.98E+05	μg/mL
Strontium[1]	ICP	<6.01E+00	n/a	n/a	n/a	μg/mL
Sulfate	IC	5.41E+03	1	3.58E+03	7.24E+03	μg/mL
Sulfur	ICP	2.40E+03	1	2.02E+03	2.78E+03	μg/mL
Thallium[1]	ICP	<1.20E+02	n/a	n/a	n/a	μg/mL
Titanium[1]	ICP	<6.01E+00	n/a	n/a	n/a	μg/mL
TIC	TIC/TOC	5.12E+03	1	4.05E+03	6.18E+03	μg/mL
TOC	TIC/TOC	4.05E+03	1	3.05E+03	5.06E+03	μg/mL
Uranium[1]	ICP	<3.00E+02	n/a	n/a	n/a	μg/mL
Vanadium[1]	ICP	<3.01E+01	n/a	n/a	n/a	μg/mL
Zinc[1]	ICP	<6.01E+00	n/a	n/a	n/a	μg/mL
Zirconium[1]	ICP	<6.01E+00	n/a	n/a	n/a	μg/mL

Note:

[1]A "less than" value was used in the calculation.

B4.0 APPENDIX B REFERENCES

Bates, J. M., 1997, *Sampling Plan for Tank 241-SX-106 Retained Gas Sampler Deployment*, TWSFG9772, Pacific Northwest National Laboratory, Richland, Washington.

Bauer, R. E., and L. P. Jackson, 1998, *Data Quality Objective to Support Resolution of the Flammable Gas Safety Issue*, HNF-SD-WM-DQO-004, Rev. 3A, DE&S Hanford, Inc., for Fluor Daniel Hanford, Inc., Richland, Washington.

Caprio, G. S., 1995, *Vapor and Gas Sampling of Single-Shell Tank 241-SX-106 Using the Vapor Sampling System*, WHC-SD-WM-RPT-145, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

De Lorenzo, D. S., J. H. Rutherford, D. J. Smith, D. B. Hiller, K. W. Johnson, and B. C. Simpson, 1994, *Tank Characterization Reference Guide*, WHC-SD-WM-TI-648, Rev. 0A, Westinghouse Hanford Company, Richland, Washington.

DOE, 1997, *Hanford Analytical Services Quality Assurance Requirements Document*, DOE/RL-96-68, Rev. 1, U.S. Department of Energy, Richland, Washington.

Dukelow, G. T., J. W. Hunt, H. Babad, and J. E. Meacham, 1995, *Tank Safety Screening Data Quality Objective*, WHC-SD-WM-SP-004, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

Homi, C. S., 1995, *Tank 241-SX-106 Tank Characterization Plan*, WHC-SD-WM-TP-314, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Huckaby, J. L., and D. R. Bratzel, 1995, *Tank 241-SX-106 Headspace Gas and Vapor Characterization Results for Samples Collected in March 1995*, WHC-SD-WM-ER-460, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Jo, J., 1997, *Tank 241-SX-106 Push Mode Core Sampling and Analysis Plan*, HNF-SD-WM-TSAP-148, Rev. 1, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

Mahoney, L. A., Z. I. Antoniak, and J. M. Bates, 1998, *Preliminary Retained Gas Sampler Measurement Results for Hanford Waste Tank 241-SX-106*, TWS98.33, Pacific Northwest National Laboratory, Richland, Washington.

Meacham, J. E., D. L. Banning, M. R. Allen, and L. D. Muhlestein, 1997, *Data Quality Objective to Support Resolution of the Organic Solvent Safety Issue*, HNF-SD-WM-DQO-026, Rev. 0, DE&S Hanford, Inc. for Fluor Daniel Hanford, Inc., Richland, Washington.

Osborne, J. W., and L. L. Buckley, 1995, *Data Quality Objectives for Tank Hazardous Vapor Safety Screening*, WHC-SD-WM-DQO-002, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

Schreiber, R. D., 1997, *Memorandum of Understanding for the Organic Complexant Safety Issue Data Requirements*, HNF-SD-WM-RD-060, Rev. 0, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

Statistical Science, 1993, *S-PLUS Reference Manual*, Version 3.2, Statistical Sciences, a division of MathSoft, Inc., Seattle, Washington.

Steen. F. H., 1998, *Tank 241-SX-106, Cores 223 and 224, Analytical Results for the Final Report*, HNF-SD-WM-DP-288, Rev. 0, Waste Management Federal Services of Hanford, Inc., for Fluor Daniel Hanford, Inc., Richland, Washington.

WHC, 1992, *Safety Department Administrative Manuals*, Westinghouse Hanford Company, Richland, Washington.

Whitney, P. D., G. Chen, P. A. Gauglitz, P. A. Meyer, and N. E. Miller, 1997, *Estimating Retained Gas Volumes in the Hanford Waste Tanks Using Waste Level Measurements*, PNNL-11693, Pacific Northwest National Laboratory, Richland, Washington.

Wilkins, N. E., R. E. Bauer, and D. M. Ogden, 1997, *Results of Vapor Space Monitoring of Flammable Gas Watch List Tanks*, HNF-SD-WM-TI-797, Rev. 2, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

This page intentionally left blank.

APPENDIX C

STATISTICAL ANALYSIS FOR ISSUE RESOLUTION

This page intentionally left blank.

APPENDIX C

STATISTICAL ANALYSIS FOR ISSUE RESOLUTION

Appendix C documents the results of the analyses and statistical and numerical manipulations required by the DQOs applicable for tank 241-SX-106. The analyses required for tank 241-SX-106 are reported as follows:

- **Section C1.0**: Statistical analysis and numerical manipulations supporting the safety screening DQO (Dukelow et al. 1995).
- **Section C2.0**: References for Appendix C.

C1.0 STATISTICS FOR THE SAFETY SCREENING DATA QUALITY OBJECTIVE

The safety screening DQO (Dukelow et al. 1995) defines decision limits in terms of one-sided 95 percent confidence intervals. The safety screening DQO limits for total alpha activity are 61.5 μCi/mL for liquids and 34.4 μCi/g for solids. The safety screening DQO limit for energetics is 480 J/g dry weight by DSC. Confidence intervals on the mean were calculated for each sample using the analytical data from the 1997 core sampling event (Steen 1998).

The upper limit of a one-sided 95 percent confidence interval on the mean is

$$\hat{\mu} + t_{(df,0.05)}\,\hat{\sigma}_{\hat{\mu}}.$$

In this equation, $\hat{\mu}$ is the arithmetic mean of the data, $\hat{\sigma}_{\hat{\mu}}$ is the estimate of the standard deviation of the mean, and $t_{(df,0.05)}$ is the quantile from Student's t distribution with *df* degrees of freedom. The degrees of freedom equals the number of samples minus one.

C1.1 TOTAL ALPHA ACTIVITY STATISTICAL ANALYSIS

For the samples with at least one total alpha activity value above the detection limit, the upper limit of a 95 percent confidence interval is given in Table C1-1. Each confidence interval can be used to make the following statement: If the upper limit is less than 34.4 μCi/g (61.5 μCi/mL for drainable liquid), then reject the null hypothesis that the alpha activity is greater than or equal to 34.4 μCi/g (61.5 μCi/mL for drainable liquid) at the 0.05 level of significance.

Table C1-1. 95 Percent Upper Confidence Limits for Total Alpha Activity.

Laboratory Sample Identification	Description	$\hat{\mu}$	df	Upper Limit	Units
S97T002179[1]	Core 223, segment 1, drainable liquid	3.95E-03	1	8.87E-03	μCi/mL
S97T002199	Core 223, segment 3, drainable liquid	3.80E-03	1	9.70E-03	μCi/mL
S97T002204F[1]	Core 223, segment 4, lower half	2.41E-02	1	2.56E-02	μCi/g
S97T002231F	Core 223, segment 5, lower half	4.70E-02	1	5.55E-02	μCi/g
S97T002232F	Core 223, segment 7, lower half	4.25E-01	1	5.26E-01	μCi/g
S97T002234F	Core 223, segment 8, lower half	8.49E-02	1	1.52E-01	μCi/g
S97T002263F	Core 223, segment 10 lower half	4.84E-01	1	5.75E-01	μCi/g
S97T002359F	Core 224, segment 5, lower half	3.32E-01	1	4.61E-01	μCi/g
S97T002361F	Core 224, segment 6, lower half	3.98E-01	1	5.94E-01	μCi/g
S97T002363F	Core 224, segment 8, lower half	4.91E-01	1	6.11E-01	μCi/g
S97T002387F	Core 224, segment 9, lower half	1.26E+00	1	1.32E+00	μCi/g
S97T002397F	Core 224, segment 11, lower half	5.98E-01	1	7.24E-01	μCi/g
S98T000694F	Core 223, segment 6	1.26E-01	1	1.64E-01	μCi/g
S98T000703F	Core 223, segment 6A	1.88E-01	1	2.29E-01	μCi/g
S98T000704F	Core 223, segment 9	1.61E-01	1	1.99E-01	μCi/g
S98T000717F	Core 224, segment 2	9.60E-03	1	1.34E-02	μCi/g
S98T000719F	Core 224, segment 7	1.25E-01	1	1.48E-01	μCi/g
S98T000720F	Core 224, segment 10	4.00E-01	1	5.96E-01	μCi/g

Note:

[1]A "less than" value was used in the calculations

Sixteen of the 22 total alpha activity solids mean results from the 1997 core samples were above the detection limit but well below the limit of 34.4 μCi/g. The solids upper limit closest to the threshold was 1.32 μCi/g for core 224, segment 9, lower half. Two of the five total alpha activity liquid mean results from the 1997 core samples were above the detection limit but well below the limit of 61.5 μCi/mL. The liquid upper limit closest to the threshold was 0.0097 μCi/mL for core 223, segment 3. Based on the results from the 1997 core sample, criticality is not an issue for this tank.

C1.2 DIFFERENTIAL SCANNING CALORIMETRY STATISTICAL ANALYSIS

For the samples with at least one DSC value above the detection limit, the upper limit of a 95 percent confidence interval is given in Table C1-2. Each confidence interval can be used to make the following statement: If the upper limit is less than 480 J/g dry weight, then reject the null hypothesis that DSC is greater than or equal to 480 J/g dry weight at the 0.05 level of significance.

Table C1-2. 95 Percent Upper Confidence Limits for Differential Scanning Calorimetry.

Laboratory Sample Identification	Description	$\hat{\mu}$	*df*	Upper Limit	Units
S97T002199	Core 223, segment 3, drainable liquid	1.53E+01	1	1.63E+01	J/g dry weight
S97T002347	Core 224, segment 5, lower half	3.93E+01	1	1.03E+02	J/g dry weight
S97T002349	Core 224, segment 6, lower half	1.40E+02	1	1.57E+02	J/g dry weight
S97T002350	Core 224, segment 6, upper half	1.25E+02	1	1.36E+02	J/g dry weight
S97T002400	Core 224, segment 11, upper half	2.69E+02	1	3.38E+02	J/g dry weight

Four DSC solids mean results from the 1997 core samples were above the detection limit but below the limit of 480 J/g dry weight. The maximum solids upper limit to a 95 percent confidence interval on the mean for DSC was 338 J/g dry weight for core 224, segment 11, upper half. This is below the threshold limit of 480 J/g. One DSC liquid mean result from the 1997 core samples was above the detection limit but below the limit of 480 J/g dry weight. For this sample, core 223, segment 3, drainable liquid, the maximum upper limit to a 95 percent confidence interval on the mean was 16.3 J/g dry weight. Based on the results from the 1997 core sample, energetic reactions are not an issue for this tank.

C2.0 APPENDIX C REFERENCES

Dukelow, G. T., J. W. Hunt, H. Babad, and J. E Meacham, 1995, *Tank Safety Screening Data Quality Objective*, WHC-SD-WM-SP-004, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

Steen. F. H., 1998, *Tank 241-SX-106, Cores 223 and 224, Analytical Results for the Final Report*, HNF-SD-WM-DP-288, Rev. 0, Waste Management Federal Services of Hanford, Inc., for Fluor Daniel Hanford, Inc., Richland, Washington.

APPENDIX D

EVALUATION TO ESTABLISH THE BEST-BASIS INVENTORY FOR SINGLE-SHELL TANK 241-SX-106

This page intentionally left blank.

APPENDIX D

EVALUATION TO ESTABLISH THE BEST-BASIS INVENTORY FOR SINGLE-SHELL TANK 241-SX-106

An effort is underway to provide waste inventory estimates that will serve as standard characterization source terms for the various waste management activities (Hodgson and LeClair 1996). As part of this effort, an evaluation of available information for single-shell tank 241-SX-106 was performed, and a best-basis inventory was established. This work, detailed in the following sections, follows the methodology that was established by the standard inventory task.

D1.0 CHEMICAL INFORMATION SOURCES

Available waste information for tank 241-SX-106 includes the following:

- Analytical data from October through December 1997 push core samples (Steen 1998)
- The HDW model document (Agnew et al. 1997) provides tank content estimates in terms of component concentrations and inventories.

D2.0 COMPARISON OF COMPONENT INVENTORY VALUES

The tank 241-SX-106 chemical and radionuclide inventories predicted from the HDW model estimates (Agnew et al. 1997) and previous best-basis estimates are shown in Tables D2-1 and D2-2. The chemical species are reported without charge designation according to the best-basis inventory convention.

Table D2-1. Comparison of Inventory Estimates for Nonradioactive Components in Tank 241-SX-106. (2 sheets)

Analyte	HDW[1] Inventory Estimate (kg)	Previous Best-Basis Estimate[2] (kg)
Al	91,900	44,500
Bi	586	462
Ca	2,790	896
Cl	17,700	11,700
Cr	15,800	12,000
F	2,620	4,610
Fe	1,240	2,790
Hg	3.78	0
K	5,250	3,370
La	11.7	21.6
Mn	435	1,140
Na	6.66E+05	6.13E+05
Ni	779	263
NO_2	2.29E+05	1.33E+05
NO_3	6.42E+05	1.08E+06
OH	3.46E+05	1.23E+05
Pb	425	330
PO_4	17,700	51,300
Si	4,470	2,290
SO_4	47,900	37,300
Sr	0	111
TIC as CO_3	53,100	53,100
TOC	24,500	13,300
U_{TOTAL}	4,830	3,600

Table D2-1. Comparison of Inventory Estimates for Nonradioactive Components in Tank 241-SX-106. (2 sheets)

Analyte	HDW[1] Inventory Estimate (kg)	Previous Best-Basis Estimate[2] (kg)
Zr	48.2	63.2
% H_2O	32.7	31.2
Density	1.61	NR

Notes:
[1]Agnew et al. (1997).
[2]LMHC (1998).

Table D2-2. Comparison of Inventory Estimates for Selected Radioactive Components in Tank 241-SX-106.

Analyte	HDW[1] Inventory Estimate (Ci)	Previous Best-Basis Estimate[2] (Ci)
^{14}C	73.7	73.7
^{90}Sr	2.45E+05	3.09E+05
^{99}Tc	525	525
^{129}I	1.01	1.01
^{137}Cs	5.68E+05	3.98E+05
^{154}Eu	1,330	1,330
^{155}Eu	501	501
^{237}Np	1.92	1.92
^{239}Pu	103	103
^{240}Pu	17.5	17.5
^{241}Pu	203	203
^{241}Am	125	125
^{60}Co	81.6	81.6

Notes:
[1]Agnew et al. (1997), decayed to January 1, 1994.
[2]LMHC (1998). Most values are based on the HDW model, decayed to January 1, 1994.

D3.0 COMPONENT INVENTORY EVALUATION

D3.1 WASTE HISTORY

Appendix A3.1 gives a full account of the waste history. Waste initially added to tank 241-SX-106 in 1954 consisted of flush water from miscellaneous sources. This continued until 1963 with some material being transferred to a crib. From 1956 through 1963 various transfers were made to other SX farm tanks. From 1964 to 1975, various flush waters from miscellaneous sources were added to the tank including some of Hanford Laboratory Operations and Battelle Northwest Laboratory waste.

In support of the 242-S Evaporator campaign, supernatant was transferred to and from the tank from 1972 to 1976. From 1978 to 1980, similar operations were conducted. In 1980, a neutralized solution of $HNO_3/KMnO_4$ was added to the tank to increase volume reduction. Water from miscellaneous sources, likely intrusions (i.e., rain water), was added to the tank from 1983 to 1993.

D3.2 CONTRIBUTING WASTE TYPES

The HDW model (Agnew et al. 1997) predicts that the tank contains a total of 2,037 kL (538 kgal) of waste. This waste consists of 3.78 kL (1 kgal) of REDOX saltcake waste and 2,032 kL (537 kgal) of saltcake and supernatant predicted from the SMM. Although the total waste volume for SMM saltcake is 2,032 kL (537 kgal), the TLM only accounts for 1,820 kL (476 kgal) of solids in the SMM saltcake.

The Sort on Radioactive Waste Type model (Hill et al. 1995) lists high-level REDOX process waste and evaporator bottoms as the primary and secondary waste types, respectively. Evaporator bottoms waste is the generic Sort on Radioactive Waste Type definition for saltcake that is roughly equivalent to the SMM waste types that result from evaporation of REDOX process supernatant in the 242-S Evaporator. Hill et al. also list REDOX process ion exchange as a tertiary waste contributor.

Hanlon (1998) reports 2,037 kL (538 kgal) of waste that consists of 231 kL (61 kgal) of supernatant, 45 kL (12 kgal) of sludge, and 1,760 kL (465 kgal) of saltcake with 848 kL (224 kgal) of drainable interstitial liquid.

D3.3 EVALUATION OF TANK WASTE VOLUME

The total volume in tank 241-SX-106 is 2,037 kL (538 kgal), as specified by Hanlon (1998) and Agnew et al. (1997).

The volume of liquid and solids in the tank, used to compute the inventories, was derived from the mass of liquid and solids recovered during extrusion of the samples in the laboratory (Steen 1998). For each sample, the mass of liquid and solids was converted to a volumetric basis using the liquid specific gravity of 1.413 and the solid density of 1.517 g/mL. The average volume percent of liquid in the tank was 40.0 percent. Therefore, 40.0 percent of the tank waste volume is equal to 814 kL (215 kgal) of liquid. Taking the difference, the solids volume is 1,223 kL (323 kgal).

D3.4 ASSUMPTIONS USED

An engineering evaluation based on tank 241-SX-106 sample results was conducted to predict tank contents and compare results with the previous best-basis and HDW model results. The engineering evaluation assumes the following.

- The total tank volume used is the one listed in both Hanlon (1998) and Agnew et al. (1997) 2,037 kL (538 kgal).
- The liquid and solids volumes used to calculate analyte inventories are specified in Section D3.3. The solids analytical mean density is 1.517 g/mL, and specific gravity of the liquids is 1.413.
- All radionuclide data are corrected to January 1, 1994.

D3.5 BASIS FOR CALCULATIONS USED IN THIS ENGINEERING EVALUATION

Table D3-1 summarizes the engineering evaluation approach.

Table D3-1. Engineering Evaluation Approach Used for Tank 241-SX-106.

Type of Waste	How Calculated	Check Method
Supernatant	Multiplied sample-based supernatant concentrations (see Table B3-8) by 814 kL (215 kgal)	Compare with predicted SMMS liquid waste types (Agnew et al.1997).
Saltcake	Multiplied sample-based solids concentrations (see Table B3-7) by the mean density of 1.517 g/mL and solids volume of 1,223 kL (323 kgal).	Compared sample-based concentrations for other tanks containing SMMS1 and SMMS2 solid waste (see Tables D3-2 and D3-3).

D3.5.1 Supernatant Mixing Model S1 Saltcake

The SMMS1 component concentrations for four tanks (241-S-101, 241-S-102, 241-U-106, and 241-U-109) known to contain the same saltcake waste type were averaged to provide a generalized composition template for SMMS1 saltcake (Sasaki et al. 1998). This composition for SMMS1 saltcake is compared with tank 241-SX-106 solid sample concentrations in Table D3-2. In addition, the saltcake composition predicted by Agnew et al. (1997) for the 242-S Evaporator saltcake generated from 1973 to 1976 (S1-SltCk) is shown in Table D3-2.

While the template and the HDW model values are reasonably comparable, some of the major analytes are noticeably different. In general, neither the template nor the model are very good predictors for the solid analyte concentrations in this tank. This may be attributed to the simplifying assumptions made in the model, the complicated and unique history associated with evaporation concentrates, and potentially biased sample data.

Table D3-2. Tank 241-SX-106 Waste Type Supernatant Mixing Model S1 Saltcake Concentrations. (2 sheets)

Analyte	SMMS1 Template Mean[1] (μg/g)	HDW Model Waste Type S1-SltCk[2] (μg/g)	241-SX-106 Solids Analytical Mean[3] (μg/g)
Al	15,100	33,400	19,600
Bi	73.5	144	<32.8[4]
Ca	282	1,210	150[4]
Cl	3,840	2,910	6,550
CO_3	NR	16,600	22,200
Cr	5,440	7,870	3,790
F	6,260	611	530
Fe	1,630	539	340[4]
Hg	NR	1.03	NR
K	1,110	1,260	1,120[4]
La	40.0	0.75	<16.4[4]
Mn	684	175	356
Na	1.82E+05	2.31E+05	1.87E+05
Ni	155	340	20.0[4]
NO_2	57,500	82,400	71,700
NO_3	1.63E+05	2.57E+05	2.86E+05
Pb	192	109	<38.2[4]

Table D3-2. Tank 241-SX-106 Waste Type Supernatant Mixing Model S1 Saltcake Concentrations. (2 sheets)

Analyte	SMMS1 Template Mean[1] ($\mu g/g$)	HDW Model Waste Type S1-SltCk[2] ($\mu g/g$)	241-SX-106 Solids Analytical Mean[3] ($\mu g/g$)
PO_4	34,000	5,310	13,900
Si	1,990	1,870	200[4]
SO_4	13,800	12,700	5,390
Sr	7.00	0	<3.28[4]
TOC	8,950	6,130	3,570
U	914	2,060	<167[4]
Zr	47.0	8.71	9.68[4]
Density (g/mL)	1.63	1.86	1.517
Radionuclides ($\mu Ci/g$)			
Total alpha	N/A	N/A	0.288
^{90}Sr	90.3	110	NR
^{137}Cs	153	175	NR

Notes:

N/A = not available
NR = not requested

[1]Sasaki et al. (1998)
[2]Agnew et al. (1997)
[3]Table B3-7
[4]Acid digestion results from RGS samples (LMHC 1998)

D3.5.2 Supernatant Mixing Model S2 Saltcake

The SMMS2 component concentrations for five tanks (241-S-101, 241-S-102, 241-U-102, 241-U-107, and 241-U-109) known to contain the same saltcake waste type were averaged to provide a generalized composition template for SMMS2 saltcake (Sasaki et al. 1998). This composition for SMMS2 saltcake is compared with tank 241-SX-106 solid sample concentrations in Table D3-3. In addition, the saltcake composition predicted by Agnew et al. (1997) for 242-S Evaporator saltcake generated from 1977 to 1980 (S2-SltSlr) is shown in Table D3-3.

While the template and the HDW model values are reasonably comparable, some of the major analytes are noticeably different. In general, neither the template nor the model are very good predictors for the solid analyte concentrations in this tank. This may be attributed to the simplifying assumptions made in the model, the complicated and unique history associated with evaporation concentrates, and potentially biased sample data.

Table D3-3. Tank 241-SX-106 Waste Type Supernatant Mixing Model S2 Saltcake Concentrations. (2 sheets)

Analyte	SMMS2 Template Mean[1] (μg/g)	HDW Model Waste Type S2-SltSlr[2] (μg/g)	241-SX-106 Solids Analytical Mean[3] (μg/g)
Al	11,000	39,500	19,600
Bi	161	622	<32.8[4]
Ca	279	400	150[4]
Cl	3,640	2,450	6,550
CO_3	NR	21,900	22,200
Cr	3,460	3,620	3,790
F	520	1,190	530
Fe	696	105	340[4]
Hg	NR	2.52	NR
K	1,060	2,630	1,120[4]
La	NR	1.21	<16.4[4]
Mn	258	67.5	356
Na	1.96E+05	2.65E+05	1.87E+05
Ni	67.0	109	20.0[4]
NO_2	38,800	98,800	71,700
NO_3	3.78E+05	1.69E+05	2.86E+05
Pb	87.0	237	<38.2[4]
PO_4	12,900	16,700	13,900
Si	445	1,080	200[4]
SO_4	11,500	29,700	5,390
Sr	28.0	0	<3.28[4]
TOC	3,270	13,300	3,570
U	964	940	<167[4]
Zr	13.0	30.3	9.68[4]
Density (g/mL)	1.56	1.95	1.517

Table D3-3. Tank 241-SX-106 Waste Type Supernatant Mixing Model S2 Saltcake Concentrations. (2 sheets)

Analyte	SMMS2 Template Mean[1] (μg/g)	HDW Model Waste Type S2-SltSlr[2] (μg/g)	241-SX-106 Solids Analytical Mean[3] (μg/g)
Radionuclides (μCi/g)			
Total alpha	N/A	N/A	0.288
^{90}Sr	85.7	39.6	NR
^{137}Cs	112	305	NR

Notes:

[1]Sasaki et al. (1998)
[2]Agnew et al. (1997)
[3]Table B3-7
[4]Acid digestion results from RGS samples (LMHC 1998)

D3.5.3 Supernatant Mixing Model

The tank 241-SX-106 supernatant concentrations from the analytical liquid means are provided in Table D3-4. In addition, the supernatant compositions predicted by Agnew et al. (1997) for S1-SltCk and S2-SltSlr are shown in Table D3-4. The HDW model concentrations compare reasonably well for some of the major analytes; however, many are noticeably different. Further, the model is not consistent in estimating concentrations.

Table D3-4. Tank 241-SX-106 Waste Type Supernatant Mixing Model Supernatant Concentrations. (2 sheets)

Analyte	HDW Model Waste Type S1-SltCk[1] (μg/mL)	HDW Model Waste Type S2-SltSlr[2] (μg/mL)	241-SX-106 Liquid Analytical Mean[3] (μg/mL)
Al	54,200	57,900	25,900
Bi	410	1,020	<60.1
Ca	256	331	<60.1
Cl	8,280	9,180	11,700
CO_3	26,700	31,600	25,600
Cr	4,620	4,630	129
F	1,740	4,460	311

Table D3-4. Tank 241-SX-106 Waste Type Supernatant Mixing Model Supernatant Concentrations. (2 sheets)

Analyte	HDW Model Waste Type S1-SltCk[1] (μg/mL)	HDW Model Waste Type S2-SltSlr[2] (μg/mL)	241-SX-106 Liquid Analytical Mean[3] (μg/mL)
Fe	39.0	67.0	<30.1
Hg	2.25	2.45	NR
K	3,590	9,860	3,890
La	2.14	4.56	<30.1
Mn	61.7	83.5	<6.01
Na	3.37E+05	5.10E+05	2.45E+05
Ni	71.0	92.8	<12.0
NO_2	1.26E+05	1.24E+05	1.31E+05
NO_3	1.62E+05	1.63E+05	2.07E+05
Pb	311	888	<60.1
PO_4	15,100	16,700	3,220
Si	769	951	85.7
SO_4	36,300	43,600	5,410
Sr	0.00	0.00	<6.01
TOC	17,500	50,100	4,050
U	639	953	<300
Zr	24.8	55.7	<6.01
Density (g/mL)	1.63	1.83	1.413
Radionuclides (μCi/mL)			
Total alpha	N/A	N/A	<3.64E-03
^{90}Sr	33.5	44.4	NR
^{137}Cs	400	1,090	NR

Notes:

[1]Agnew et al. (1997) after applying a density of 1.63 g/mL
[2]Agnew et al. (1997) after applying a density of 1.83 g/mL
[2]See Table B3-8

D3.6 ESTIMATED COMPONENT INVENTORIES

The chemical inventory of tank 241-SX-106 is based on the estimated saltcake and supernatant volumes (see Table D3-1). The resulting inventories are provided in Table D3-5. The inventories estimated by the HDW model are included for comparison.

Total Hydroxide. Once the best-basis inventories were determined, the hydroxide inventory was calculated by performing a charge balance with the valence of other analytes. This charge balance approach is consistent with that used by Agnew et al. (1997).

Table D3-5. Comparison of Inventory Estimates for Tank 241-SX-106. (2 sheets)

Component	Sample-Based Solids Inventory[1] (kg)	Sample-Based Liquids Inventory[2] (kg)	Sample-Based Total Inventory (kg)	HDW Model Estimates[3] (kg)
Al	36,400	21,100	57,500	91,900
Bi	<60.9	<48.9	<110	586
Ca	278	<48.9	<327	2,790
Cl	12,200	9,520	21,700	17,700
TIC as CO_3	41,200	20,800	62,000	53,100
Cr	7,030	105	7,140	15,800
F	983	253	1,240	2,620
Fe	631	<24.5	<656	1,240
K	2,070	3,170	5,240	5,250
La	<30.5	<24.5	<55.0	11.7
Mn	660	<4.89	<665	435
Na	3.47E+05	1.99E+05	5.46E+05	6.66E+05
Ni	<37.1	<9.77	<46.9	779
NO_2	1.33E+05	1.07E+05	2.40E+05	2.29E+05
NO_3	5.31E+05	1.68E+05	6.99E+05	6.42E+05
Pb	<70.9	<48.9	<120	425
PO_4	25,800	2,620	28,400	17,700
Si	372	69.8	442	4,470
SO_4	10,000	4,400	14,400	47,900
Sr	<6.09	<4.89	<11.0	0.00
TOC	6,620	3,300	9,920	24,500

Table D3-5. Comparison of Inventory Estimates for Tank 241-SX-106. (2 sheets)

Component	Sample-Based Solids Inventory[1] (kg)	Sample-Based Liquids Inventory[2] (kg)	Sample-Based Total Inventory (kg)	HDW Model Estimates[3] (kg)
U_{TOTAL}	<309	<244	<553	4,830
Zr	18.0	<4.89	<22.8	48.2
Total alpha (Ci)	534	<2.96	<537	NR
^{137}Cs (Ci)[4]	NR	NR	NR	5.68E+05
^{90}Sr (Ci)[4]	NR	NR	NR	2.45E+05

Notes:

[1]Based on the mean solids concentrations from Tables D3-2 with a volume of 1,223 kL (323 kgal) and a density of 1.517 g/mL.

[2]Based on the mean liquid concentrations from Tables D3-4 with a volume of 814 kL (215 kgal).

[3]Agnew et al. (1997)

[4]Radionuclides decayed to January 1, 1994.

D4.0 DEFINE THE BEST-BASIS AND ESTABLISH COMPONENT INVENTORIES

An effort is underway to provide waste inventory estimates that will serve as standard characterization source terms for the various waste management activities (Hodgson and LeClair 1996). As part of this effort, an evaluation of chemical information for tank 241-SX-106 was performed, and a best-basis inventory was established. This work, detailed in the following sections, follows the methodology that was established by the standard inventory task. The following information was used in the evaluation:

- Analytical data from the 1997 push-mode core sampling event (Appendix B)
- Inventory estimates generated for this tank from the HDW model (Agnew et al. 1997).

Based on this engineering assessment, a best-basis inventory was developed for tank 241-SX-106 using the 1997 core sampling analytical data. Where analytical data were not available, the HDW model inventory estimates reported by Agnew et al. (1997) were used as the best basis for this tank.

Best-basis tank inventory values are derived for 46 key radionuclides (as defined in Section 3.1 of Kupfer et al. 1997), all decayed to a common report date of January 1, 1994. Often, waste sample analyses have only reported ^{90}Sr, ^{137}Cs, $^{239/240}Pu$, and total uranium, or total beta and total alpha, while other key radionuclides such as ^{60}Co, ^{99}Tc, ^{129}I, ^{154}Eu, ^{155}Eu, and ^{241}Am, have been infrequently reported. Therefore, it has been necessary to derive most of the 46 key radionuclides by computer models. These models estimate radionuclide activity in batches of reactor fuel, account for the split of radionuclides to various separations plant waste streams, and track their movement with tank waste transactions. (These computer models are described in Kupfer et al. 1997, Section 6.1, and in Watrous and Wootan 1997.)

Model-generated values for radionuclides in any of 177 tanks are reported in the HDW Revision 4 model results (Agnew et al. 1997). The best-basis value for any one analyte may be either a model result or a sample or engineering assessment-based result, if available.

The best-basis inventory estimate for tank 241-SX-106 is presented in Tables D4-1 and D4-2. The mercury inventory was specified in Simpson (1998). The inventory of strontium was calculated from the ^{90}Sr activity. The inventory of ^{90}Sr was based on a weighted average of the template estimates for waste types SMMS1 and SMMS2 from Sasaki et al. (1998). The inventory of ^{137}Cs was based on the heat load calculated from the difference between the total heat load estimate of 3,180 W (10,840 Btu/hr) provided by Kummerer (1995) and the heat load attributed to ^{90}Sr.

The inventory values reported in Tables D4-1 and D4-2 are subject to change. Refer to the Tank Characterization Database for the most current inventory values.

Table D4-1. Best-Basis Inventory Estimates for Nonradioactive Components in Tank 241-SX-106 (Effective May 31, 1998). (2 sheets)

Analyte	Total Inventory (kg)	Basis (S, M, E, or C)[1]	Comment
Al	57,500	S	
Bi	0	E	Not expected based on process history
Ca	278	S/E	Solids only
Cl	21,700	S	
TIC as CO_3	62,000	S	
Cr	7,140	S	
F	1,240	S	
Fe	631	S/E	Solids only
Hg	0	E	Simpson (1998)

Table D4-1. Best-Basis Inventory Estimates for Nonradioactive Components in Tank 241-SX-106 (Effective May 31, 1998). (2 sheets)

Analyte	Total Inventory (kg)	Basis (S, M, E, or C)[1]	Comment
K	5,240	S	
La	55	S/E	Upper bounding limit
Mn	660	S/E	Solids only
Na	5.46E+05	S	
Ni	0	E	Not expected based on process history
NO_2	2.40E+05	S	
NO_3	6.99E+05	S	
OH_{TOTAL}	1.71E+05	C	
Pb	120	S/E	Upper bounding limit
PO_4	28,400	S	
Si	442	S	
SO_4	14,400	S	
Sr	4.00	E	Calculated from ^{90}Sr assuming that ^{90}Sr is 30 wt% of total strontium
TOC	9,920	S	
U_{TOTAL}	553	S/E	Upper bounding limit
Zr	18	S/E	Solids only

Note:

[1]S = sample based (see Appendix B), M = HDW model based (Agnew et al. 1997), E =engineering assessment based, and C = calculated by charge balance; includes oxides as hydroxides, not including CO_3, NO_2, NO_3, PO_4, SO_4, and SiO_3.

Table D4-2. Best-Basis Inventory Estimates for Radioactive Components in Tank 241-SX-106 Decayed to January 1, 1994 (Effective May 31, 1998). (3 sheets)

Analyte	Total Inventory (Ci)	Basis (S, M, or E)[1]	Comment
^{3}H	513	M	
^{14}C	73.7	M	
^{59}Ni	4.80	M	
^{60}Co	81.6	M	
^{63}Ni	470	M	
^{79}Se	7.35	M	
^{90}Sr	1.70E+05	E	Based on the template estimates for waste types SMMS1 saltcake and SMMS2 saltcake from Sasaki et al. (1998)
^{90}Y	1.70E+05	E	Based on the ^{90}Sr activity
^{93}Zr	36.1	M	
^{93m}Nb	26.2	M	
^{99}Tc	525	M	
^{106}Ru	0.0145	M	
^{113m}Cd	189	M	
^{125}Sb	351	M	
^{126}Sn	11.1	M	
^{129}I	1.01	M	
^{134}Cs	5.57	M	
^{137}Cs	4.71E+05	E	Based on the heat load calculated from the difference between the total heat load estimate from Kummerer (1995) and the heat load attributed to ^{90}Sr
^{137m}Ba	4.45E+05	E	Based on 0.946 of the ^{137}Cs activity
^{151}Sm	25,900	M	
^{152}Eu	8.49	M	
^{154}Eu	1,330	M	
^{155}Eu	501	M	
^{226}Ra	3.15E-04	M	
^{227}Ac	0.00199	M	

Table D4-2. Best-Basis Inventory Estimates for Radioactive Components in Tank 241-SX-106 Decayed to January 1, 1994 (Effective May 31, 1998). (3 sheets)

Analyte	Total Inventory (Ci)	Basis (S, M, or E)[1]	Comment
^{228}Ra	0.307	M	
^{229}Th	0.00720	M	
^{231}Pa	0.00913	M	
^{232}Th	0.0204	M	
^{232}U	0.181	S/E/M	Based on ICP uranium sample result ratioed to HDW estimates for uranium isotopes
^{233}U	0.693	S/E/M	Based on ICP uranium sample result ratioed to HDW estimates for uranium isotopes
^{234}U	0.203	S/E/M	Based on ICP uranium sample result ratioed to HDW estimates for uranium isotopes
^{235}U	0.00823	S/E/M	Based on ICP uranium sample result ratioed to HDW estimates for uranium isotopes
^{236}U	0.00636	S/E/M	Based on ICP uranium sample result ratioed to HDW estimates for uranium isotopes
^{237}Np	1.92	M	
^{238}Pu	6.45	S/E/M	Based on total alpha activity sample result ratioed to HDW estimates for alpha isotopes
^{238}U	0.185	S/E/M	Based on ICP uranium sample result ratioed to HDW estimates for uranium isotopes
^{239}Pu	222	S/E/M	Based on total alpha activity sample result ratioed to HDW estimates for alpha isotopes
^{240}Pu	37.6	S/E/M	Based on total alpha activity sample result ratioed to HDW estimates for alpha isotopes
^{241}Am	269	S/E/M	Based on total alpha activity sample result ratioed to HDW estimates for alpha isotopes
^{241}Pu	436	S/E/M	Based on total alpha activity sample result ratioed to HDW estimates for alpha isotopes
^{242}Cm	0.689	S/E/M	Based on total alpha activity sample result ratioed to HDW estimates for alpha isotopes
^{242}Pu	0.00239	S/E/M	Based on total alpha activity sample result ratioed to HDW estimates for alpha isotopes

Table D4-2. Best-Basis Inventory Estimates for Radioactive Components in Tank 241-SX-106 Decayed to January 1, 1994 (Effective May 31, 1998). (3 sheets)

Analyte	Total Inventory (Ci)	Basis (S, M, or E)[1]	Comment
^{243}Am	0.00932	S/E/M	Based on total alpha activity sample result ratioed to HDW estimates for alpha isotopes
^{243}Cm	0.0638	S/E/M	Based on total alpha activity sample result ratioed to HDW estimates for alpha isotopes
^{244}Cm	0.630	S/E/M	Based on total alpha activity sample result ratioed to HDW estimates for alpha isotopes

Note:

[1]S = sample-based (see Appendix B), M =HDW model based (Agnew et al. 1997), E = engineering assessment based.

D5.0 APPENDIX D REFERENCES

Agnew, S. F., J. Boyer, R. A. Corbin, T. B. Duran, J. R. Fitzpatrick, K. A. Jurgensen, T. P. Ortiz, and B. L. Young, 1997, *Hanford Tank Chemical and Radionuclide Inventories: HDW Model Rev. 4*, LA-UR-96-3860, Los Alamos National Laboratory, Los Alamos, New Mexico.

Hanlon, B. M., 1998, *Waste Tank Summary Report for Month Ending May 31, 1998*, HNF-EP-0182-122, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

Hill, J. G., G. S. Anderson, and B. C. Simpson, 1995, *The Sort on Radioactive Waste Type Model: A Method to Sort Single-Shell Tanks into Characteristic Groups*, PNL-9814, Rev. 2, Pacific Northwest Laboratory, Richland, Washington

Hodgson, K. M. and M. D. LeClair, 1996, *Work Plan for Defining a Standard Inventory Estimate for Wastes Stored in Hanford Site Underground Tanks*, WHC-SD-WM-WP-311, Rev. 1, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

Kummerer, M., 1995, Heat Removal Characteristics of Waste Storage Tanks, WHC-SD-WM-SARR-010, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Kupfer, M. J., A. L. Boldt, B. A. Higley, K. M. Hodgson, L. W. Shelton, B. C. Simpson, R. A. Watrous, M. D. LeClair, G. L. Borsheim, R. T. Winward, R. M. Orme, N. G. Colton, S. L. Lambert, D. E. Place, and W. W. Schulz, 1997, *Standard Inventories of Chemicals and Radionuclides in Hanford Site Tank Wastes*, HNF-SD-WM-TI-740, Rev. 0A, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

LMHC, 1998, Best-Basis Inventory for Tank 241-SX-106, Tank Characterization Database, May 31, 1998, Internet at http://twins.pnl.gov:8001/TCD/main.html, Lockheed Martin Hanford Corp., Richland, Washington.

Sasaki, L. M., S. R. Wilmarth, and T. T. Tran, 1998, *Tank Characterization Report for Single-Shell Tank 241-U-103*, HNF-SD-WM-ER-712, Rev. 1, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

Simpson, B. C., 1998, *Best Basis Inventory Change Package for Reconciliation of Mercury Values, Change Package 7*, (internal memorandum 7A120-98-005 to J. W. Cammann, February 26), Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

Steen, F. H., 1998, *Tank 241-SX-106, Cores 223 and 224, Analytical Results for the Final Report*, HNF-SD-WM-DP-288, Rev. 0, Waste Management Federal Services of Hanford, Inc., for Fluor Daniel Hanford, Inc., Richland, Washington.

Watrous, R. A. and D. W. Wootan, 1997, *Activity of Fuel Batches Processed Through Hanford Separations Plants, 1944 Through 1989,* HNF-SD-WM-TI-794, Rev. 0, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

This page intentionally left blank.

APPENDIX E

BIBLIOGRAPHY FOR TANK 241-SX-106

This page intentionally left blank.

APPENDIX E

BIBLIOGRAPHY FOR TANK 241-SX-106

Appendix E provides a bibliography of information that supports the characterization of tank 241-SX-106. This bibliography represents an in-depth literature search of all known information sources that provide sampling, analysis, surveillance, and modeling information, as well as processing occurrences associated with tank 241-SX-106 and its respective waste types.

The references in this bibliography are separated into three broad categories containing references broken down into subgroups. These categories and their subgroups are listed below.

I. NON-ANALYTICAL DATA

- Ia. Models/Waste Type Inventories/Campaign Information
- Ib. Fill History/Waste Transfer Records
- Ic. Surveillance/Tank Configuration
- Id. Sample Planning/Tank Prioritization
- Ie. Data Quality Objectives/Customers of Characterization Data

II. ANALYTICAL DATA - SAMPLING OF TANK WASTE AND WASTE TYPES

- IIa. Sampling of Tank 241-SX-106
- IIb. Sampling of Similar Waste Types

III. COMBINED ANALYTICAL/NON-ANALYTICAL DATA

- IIIa. Inventories Using Both Campaign and Analytical Information
- IIIb. Compendium of Existing Physical and Chemical Documented Data Sources

This bibliography is broken down into the appropriate sections of material to use, with an annotation at the end of each reference, or set of references, describing the information source. Where possible, a reference is provided for information sources. A majority of the information listed below may be found in the Lockheed Martin Hanford Corp. Tank Characterization and Safety Resource Center.

I. NON-ANALYTICAL DATA

Ia. Models/Waste Type Inventories/Campaign Information

Agnew, S. F., J. Boyer, R. A. Corbin, T. B. Duran, J. R. Fitzpatrick, K. A. Jurgensen, T. P. Ortiz, and B. L. Young, 1997, *Hanford Tank Chemical and Radionuclide Inventories: HDW Model Rev. 4*, LA-UR-96-3860, Los Alamos National Laboratory, Los Alamos, New Mexico.

- Contains waste type summaries, primary chemical compound/analyte and radionuclide estimates for sludge, supernatant, and solids, as well as SMM, TLM, and individual tank inventory estimates.

Anderson, J. D., 1990, *A History of the 200 Area Tank Farms*, WHC-MR-0132, Westinghouse Hanford Company, Richland, Washington.

- Contains single-shell tank fill history and primary campaign/waste type information to 1981.

Jungfleisch, F. M., and B. C. Simpson, 1993, *Preliminary Estimation of the Waste Inventories in Hanford Tanks Through 1980*, WHC-SD-WM-TI-057, Rev. 0A, Westinghouse Hanford Company, Richland, Washington.

- Describes a model for estimating tank waste inventories using process knowledge; radioactive decay estimates using ORIGEN; and assumptions about waste types, solubility, and constraints.

Ib. Fill History/Waste Transfer Records

Agnew, S. F., R. A. Corbin, T. B. Duran, K. A. Jurgensen, T. P. Ortiz, and B. L. Young, 1997, *Waste Status and Transaction Record Summary (WSTRS) Rev. 4*, LA-UR-97-311, Los Alamos National Laboratory, Los Alamos, New Mexico.

- Contains spreadsheets depicting all known tank additions/transfers.

Anderson, J. D., 1990, *A History of the 200 Area Tank Farms*, WHC-MR-0132, Westinghouse Hanford Company, Richland, Washington.

- Contains tank fill histories and primary campaign/waste type information to 1981.

Ic. Surveillance/Tank Configuration

Alstad, A. T., 1993, *Riser Configuration Document for Single-Shell Waste Tanks*, WHC-SD-MW-TI-053, Rev. 9, Westinghouse Hanford Company, Richland, Washington.

- Shows riser location in relation to tank aerial view as well as a description of each riser and its contents.

Lipnicki, J., 1997, *Waste Tank Risers Available for Sampling*, HNF-SD-WM-TI-710, Rev. 4, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

- Assesses riser locations for each tank; however, not all tanks are included/completed. Also includes an estimate of the risers available for sampling.

Tran, T. T., 1993, *Thermocouple Status Single-Shell and Double-Shell Waste Tanks*, WHC-SD-WM-TI-553, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

- Provides thermocouple location and status information for double- and single-shell tanks.

Welty, R. K., 1988, *Waste Storage Tank Status and Leak Detection Criteria, Volumes I and II*, WHC-SD-WM-TI-356, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

- Provides leak detection information for all single- and double-shell tanks. Liquid level, liquid observation well, and dry well readings are included.

Id. Sample Planning/Tank Prioritization

Bates, J. M., 1997, *Sampling Plan for Tank 241-SX-106 Retained Gas Sampler Deployment*, TWSFG9772, Pacific Northwest National Laboratory, Richland, Washington.

- Contains the sampling scheme for core samples, using the RGS, to be taken from tank 241-SX-106.

Brown, T. M., J. W. Hunt, and L. J. Fergestrom, 1997, *Tank Characterization Technical Sampling Basis*, WHC-SD-WM-TA-164, Rev. 3, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

- Establishes an approach to determine the priority for tank sampling and characterization and identifies high priority tanks for sampling.

Jo, J., 1997, *Tank 241-SX-106 Push Mode Core Sampling and Analysis Plan*, HNF-SD-WM-TSAP-148, Rev. 1, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

- Contains detailed sampling and analysis scheme for core samples to be taken from tank 241-SX-106 to address applicable DQOs.

Mulkey, C. H., 1996, *Single-Shell Tank System Waste Analysis Plan*, WHC-EP-0356, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

- Waste analysis plan for single-shell tanks as required by WAC-173-303 and 40 CFR Part 265.

Stanton, G. A., 1998, *Baseline Sampling Schedule, Change 98-01*, (internal memorandum 79520-98-001 to Distribution, February 5), Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

- Provides a tank waste sampling schedule through fiscal year 2002 and lists samples taken since 1994.

Winkelman, W. D., 1996, *Tank 241-SX-106 Tank Characterization Plan*, WHC-SD-WM-TP-314, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

- Discusses all relevant DQOs and how their requirements will be met for tank 241-SX-106.

Winkelman, W. D., M. R. Adams, T. M. Brown, J. W. Hunt, D. J. McCain, and L. J. Fergestrom, 1997, *Fiscal Year 1997-1998 Waste Information Requirements Document*, HNF-SD-WM-PLN-126, Rev. 0A, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

- Contains requirements from the *Hanford Federal Facility Agreement and Consent Order*, *Recommendation 93-5 Implementation Plan*, and other requirement sources that, along with managerial and operational constraints, are combined to summarize the TWRS characterization program deliverables for fiscal years 1997 and 1998.

Ie. Data Quality Objectives/Customers of Characterization Data

Bauer, R. E., and L. P. Jackson, 1998, *Data Quality Objective to Support Resolution of the Flammable Gas Safety Issue*, WHC-SD-WM-DQO-004, Rev. 3A, DE&S Hanford, Inc., for Fluor Daniel Hanford, Inc., Richland, Washington.

- Contains flammable gas program data needs, list of tanks to be evaluated, decision thresholds, and decision logic flow diagram.

Cash, R. J., 1996, *Application of "Flammable Gas Tank Safety Program: Data Requirements for Core Sampling Analysis Developed Through the Data Quality Objective Process", Rev. 2*, (internal memorandum 79300-96-028, to S. J. Eberlein, July 12), Westinghouse Hanford Company, Richland, Washington.

- Identifies single-shell tanks to use the retained gas sampling system.

DOE-RL, 1996, *Recommendation 93-5 Implementation Plan*, DOE/RL-94-0001, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

- Defines needs and milestones identified by the Defense Nuclear Facility Safety Board.

Dukelow, G. T., J. W. Hunt, H. Babad, and J. E. Meacham, 1995, *Tank Safety Screening Data Quality Objective*, WHC-SD-WM-SP-004, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

- Determines whether tanks are under safe operating conditions.

Meacham, J. E., D. L. Banning, M. R. Allen, and L. D. Muhlestein, 1997, *Data Quality Objective to Support Resolution of the Organic Solvent Safety Issue*, HNF-SD-WM-DQO-026, Rev. 0, DE&S Hanford, Inc., for Fluor Daniel Hanford, Inc., Richland, Washington.

- Contains requirements for the organic solvent DQO.

Osborne, J. W., and L. L. Buckley, 1995, *Data Quality Objectives for Tank Hazardous Vapor Safety Screening*, WHC-SD-WM-DQO-002, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

- Determines whether tank vapor spaces contain potentially hazardous gases and vapors.

Schreiber, R. D., 1997, *Memorandum of Understanding for the Organic Complexant Safety Issue Data Requirements*, HNF-SD-WM-RD-060, Rev. 0, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

- Contains organic program data needs, list of tanks to be evaluated, decision thresholds, and decision logic flow diagram.

II. ANALYTICAL DATA - SAMPLING OF TANK WASTE AND WASTE TYPES

IIa. Sampling of Tank 241-SX-106

Brown, G. E., 1978, *Concentration of Tank 106-SX Customer Waste*, (internal letter 60120-78-149 to K. G. Carothers, December 22), Rockwell Hanford Operations, Richland, Washington.

- Contains historical sample analysis results.

Buckingham, J. S., 1977, *Evaporation of Synthetic 106-SX Solution*, (internal letter to R. E. Van der Cook, February 25), Atlantic Richfield Hanford Company, Richland, Washington.

- Contains historical sample analysis results.

Buckingham, J. S., 1977, *Evaporator Support and Tank Farm Assistance*, (internal letter to D. C. Lini, January 14), Atlantic Richfield Hanford Company, Richland, Washington.

- Contains historical sample analysis results.

Caprio, G. S., 1995, *Vapor and Gas Sampling of Single-Shell Tank 241-SX-106 Using the Vapor Sampling System*, WHC-SD-WM-RPT-145, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

- Contains March 1995 vapor sample analysis results.

Delegard, C. H., 1979, *Viscosity/Cooling Curve for Tank 106-SX Sample Composite*, (internal letter 65124-79-003 to H. J. Eding, November 1), Rockwell Hanford Operations, Richland, Washington.

- Contains historical sample analysis results.

Horton, J. E., 1977, *Characterization of Tank 106-SX Supernatant and Sludge*, (internal letter to W. R. Christensen, March 31), Atlantic Richfield Hanford Company, Richland, Washington.

- Contains historical supernatant and sludge sample analysis results.

Horton, J. E., 1977, *Engineering Assistance Waste Concentration*, (internal letter to D. C. Lini, June), Atlantic Richfield Hanford Company, Richland, Washington.

- Contains historical supernatant and sludge sample analysis results.

Horton, J. E., 1978, *Analysis of 106-SX Tanks, Sample #8301*, (internal letter 60120-78-055 to R. J. Cain, June 29), Rockwell Hanford Operations, Richland, Washington.

- Contains historical sample analysis results.

Huckaby, J. L., and D. R. Bratzel, 1995, *Tank 241-SX-106 Headspace Gas and Vapor Characterization Results for Samples Collected in March 1995*, WHC-SD-WM-ER-460, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

- Contains March 1995 vapor sample analysis results.

Klinger, G. S., T. W. Clauss, M. W. Ligotke, K. H. Pool, R. B. Lucke, B. D. McVeety, K. B. Olsen, O. P. Bredt, J. S. Fruchter, and S. C. Goheen, 1995, *Vapor Space Characterization of Waste Tank 241-SX-106: Results from Samples Collected on 3/24/95*, PNNL-10584, Pacific Northwest National Laboratory, Richland, Washington.

- Contains March 1995 vapor sample analysis results.

Lane, T. A., 1979, *Customer Waste Flowsheet Development: Tank 106-SX*, (internal letter 65120-79-133 J to D. R. Jorgenson, September 4), Rockwell Hanford Operations, Richland, Washington.

- Contains historical sample analysis results.

Supervisor, Analytical Services, 1976, *Analysis of Tank Farm Sample, Sample No: 6376, Tank 106-SX, Received 8/21/76*, (internal letter), Atlantic Richfield Hanford Company, Richland, Washington.

- Contains historical sample analysis results.

Supervisor, Analytical Services, 1976, *Analysis of Tank Farm Sample, Sample No: T7327, Tank 106-SX, Received 9/20/76*, (internal letter), Atlantic Richfield Hanford Company, Richland, Washington.

- Contains historical sample analysis results.

Supervisor, Analytical Services, 1978, *Analysis of Tank Farm Samples, Serial No: 5601, Tank 106 SX, Received 2/9/78*, (internal letter to D. R. Autrey on March 6), Rockwell Hanford Operations, Richland, Washington.

- Contains historical sample analysis results.

Wheeler, R. E., 1974, *Analysis of Tank Farm Samples, Sample: T-8041, 106-SX*, (internal letter to R. L. Walser, December 6), Atlantic Richfield Hanford Company, Richland, Washington.

- Contains historical sample analysis results.

IIb. Sampling of Similar Waste Types

Bell, K. E., 1997, *Tank Characterization Report for Single-Shell Tank 241-U-108*, HNF-SD-WM-ER-639, Rev. 0A, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

- Contains characterization data for the waste in tank 241-U-109, which includes SMMS1 and SMMS2 waste.

Brown, T. M., and J. Franklin, 1997, *Tank Characterization Report for Single-Shell Tank 241-U-105*, HNF-SD-WM-ER-617, Rev. 0A, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

- Contains characterization data for the waste in tank 241-U-105, which includes SMMS2 waste.

Campbell, G. D., 1975, *242-S Evaporator-Crystallizer Material Balance*, (internal memorandum to R. L. Walker, August 5), Atlantic Richfield Hanford Company Operations, Richland, Washington.

- Contains chemical species material balance in support of the 242-S Evaporator.

Delegard, C. H., 1979, *Customer Waste Flowsheet Development: Third Pass Run of Tank 106-SX/107-S Blend*, (internal letter 65120-79-134 J to D. R. Jorgenson, September 5), Rockwell Hanford Operations, Richland, Washington.

- Contains historical sample analysis results in support of the 242-S Evaporator.

Eggers, R. F., R. H. Stephens, and T. T. Tran, 1997, *Tank Characterization Report for Single-Shell Tank 241-S-102*, HNF-SD-WM-ER-611, Rev. 0A, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

- Contains characterization data for the waste in tank 241-S-102, which includes SMMS1 and SMMS2 waste.

Field, J. G., and B. A. Higley, 1997, *Tank Characterization Report for Single-Shell Tank 241-U-109*, HNF-SD-WM-ER-609, Rev. 0A, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

- Contains characterization data for the waste in tank 241-U-109, which includes SMMS1 and SMMS2 waste.

Hu, T. A., 1997, *Tank Characterization Report for Single-Shell Tank 241-U-102*, HNF-SD-WM-ER-618, Rev. 0A, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

- Contains characterization data for the waste in tank 241-U-102, which includes SMMS2 waste.

Jo, J., B. J. Morris, and T. T. Tran, 1997, *Tank Characterization Report for Single-Shell Tank 241-U-107*, HNF-SD-WM-ER-614, Rev. 0A, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

- Contains characterization data for the waste in tank 241-U-107, which includes SMMS2 waste.

Puryear, D. A., and J. S. Buckingham, 1971, *Status Report on Waste Solidification Studies and Separations Chemistry Laboratory*, (internal memorandum to M. H. Campbell et al., Process Aids 00362, July 23), Atlantic Richfield Hanford Company Operations, Richland, Washington.

- Contains historical sample separation results in support of the 242-S Evaporator.

III. COMBINED ANALYTICAL/NON-ANALYTICAL DATA

IIIa. Inventories Using Both Campaign and Analytical Information

Agnew, S. F., R. A. Corbin, J. Boyer, T. B. Duran, K. A. Jurgensen, T. P. Ortiz, B. L. Young, R. Anema, and C. Ungerecht, 1996, *History of Organic Carbon in Hanford HLW Tanks: HDW Model Rev. 3*, LA-UR-96-989, Los Alamos National Laboratory, Los Alamos, New Mexico.

- Attempts to account for the disposition of soluble organics and provides estimates of TOC content for each tank.

Agnew, S. F., J. Boyer, R. A. Corbin, T. B. Duran, J. R. Fitzpatrick, K. A. Jurgensen, T. P. Ortiz, and B. L. Young, 1997, *Hanford Tank Chemical and Radionuclide Inventories: HDW Model Rev. 4*, LA-UR-96-3860, Los Alamos National Laboratory, Los Alamos, New Mexico.

- Contains waste type summaries, primary chemical compound/analyte and radionuclide estimates for sludge, supernatant, and solids, as well as SMM, TLM, and individual tank inventory estimates.

Allen, G. K., 1976, *Estimated Inventory of Chemicals Added to Underground Waste Tanks, 1944 - 1975*, ARH-CD-601B, Rev. 0, Atlantic Richfield Hanford Company, Richland, Washington.

- Contains major components for waste types and some assumptions. Purchase records are used to estimate chemical inventories.

Brevick, C. H., J. L. Stroup, and J. W. Funk, 1997, *Historical Tank Content Estimate for the Southwest Quadrant of the Hanford 200 East Area*, WHC-SD-WM-ER-352, Rev. 1, Fluor Daniel Northwest, Inc., for Fluor Daniel Hanford, Inc., Richland, Washington.

- Contains summary information for tanks in S, SX and U Tank Farms as well as in-tank photograph collages and inventory estimates.

Klem, M. J., 1988, *Inventory of Chemicals Used at Hanford Production Plants and Support Operations (1944 - 1980)*, WHC-EP-0172, Westinghouse Hanford Company, Richland, Washington.

- Provides a list of chemicals used in production facilities and support operations that sent wastes to the single-shell tanks. List is based on chemical process flowsheets, essential materials consumption records, letters, reports, and other historical data.

Kupfer, M. J., A. L. Boldt, B. A. Higley, K. M. Hodgson, L. W. Shelton, B. C. Simpson, R. A. Watrous, M. D. LeClair, G. L. Borsheim, R. T. Winward, R. M. Orme, N. G. Colton, S. L. Lambert, D. E. Place, and W. W. Schulz, 1997, *Standard Inventories of Chemicals and Radionuclides in Hanford Site Tank Wastes*, HNF-SD-WM-TI-740, Rev. 0A, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

- Contains a global component inventory for 200 Area waste tanks' major constituents.

Schmittroth, F. A., 1995, *Inventories for Low-Level Tank Waste*, WHC-SD-WM-RPT-164, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

- Contains a global inventory based on process knowledge and radioactive decay estimations using ORIGEN2. Plutonium and uranium waste contributions are taken at one percent of the amount used in processes. Also compares information on ^{99}Tc from both ORIGEN2 and analytical data.

Toth, J. J., C. E. Willingham, P. G. Heasler, and P.D. Whitney, 1994, *Organic Carbon in Hanford Single-Shell Tank Waste*, PNL-9434, Pacific Northwest Laboratory, Richland, Washington.

- Contains organic carbon analytical results and model estimates for tanks.

IIIb. Compendium of Existing Physical and Chemical Documented Data Sources

Agnew, S. F., and J. G. Watkin, 1994, *Estimation of Limiting Solubilities for Ionic Species in Hanford Waste Tank Supernates*, LA-UR-94-3590, Los Alamos National Laboratory, Los Alamos, New Mexico.

- Document gives solubility ranges used for key chemical and radionuclide components based on supernate sample analyses.

Brevick, C. H., L. A. Gaddis, and E. D. Johnson, 1996, *Tank Waste Source Term Inventory Validation, Vol I, II, and III*, WHC-SD-WM-ER-400, Rev. 0A, Westinghouse Hanford Company, Richland, Washington.

- Contains a quick reference to sampling information in spreadsheet or graphical form for 24 chemicals and 11 radionuclides for all the tanks.

Brevick, C. H., J. L. Stroup, and J. W. Funk, 1997, *Supporting Document for the Historical Tank Content Estimate for SX-Tank Farm*, WHC-SD-WM-ER-324, Rev. 1, Fluor Daniel Northwest, Inc., for Fluor Daniel Hanford, Inc., Richland, Washington.

- Contains summary information for tanks in the SX Tank Farm and appendices containing more detailed information including tank waste level history, tank temperature history, cascade and dry well charts, riser information, in-tank photograph collages, and tank layer model bar chart and spreadsheet.

Claybrook, S. W., 1993, *An Evaporation Analysis for Tanks 241-SX-103, 241-SX-105, and 241-SX-106*, Westinghouse Hanford Company, Richland, Washington.

- Contains analysis of evaporation of waste from specific tanks.

Hanlon, B. M., 1998, *Waste Tank Summary Report for Month Ending May 31, 1998*, HNF-EP-0182-122, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

- Updated monthly, contains a summary of tank waste volumes, watch list tanks, occurrences, tank integrity information, equipment readings, tank location, leak volumes, and other miscellaneous tank information.

Hill, J. G., G. S. Anderson, and B. C. Simpson, 1995, *The Sort on Radioactive Waste Type Model: A Method to Sort Single-Shell Tanks into Characteristic Groups*, PNL-9814, Rev. 2, Pacific Northwest Laboratory, Richland, Washington.

- Describes a system of sorting single-shell tanks into groups based on the major waste types contained in each tank.

Husa, E. I., R. E. Raymond, R. K. Welty, S. M. Griffith, B. M. Hanlon, R. R. Rios, and N. J. Vermeulen, 1993, *Hanford Site Waste Storage Tank Information Notebook*, WHC-EP-0625, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

- Contains in-tank photographs and summaries of the tank description, leak detection system, and tank status.

Husa, E. I., 1995, *Hanford Waste Tank Preliminary Dryness Evaluation*, WHC-SD-WM-TI-703, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

- Assesses the relative dryness of tank wastes.

LMHC, 1998, Tank Characterization Data Base, Internet at http://twins.pnl.gov:8001/TCD/main.html, Lockheed Martin Hanford Corp., Richland, Washington.

- Contains analytical data for each of the 177 Hanford Site waste tanks.

Shelton, L. W., 1995, *Chemical and Radionuclide Inventory for Single- and Double-Shell Tanks*, (internal memorandum 75520-95-007 to R. M. Orme, August 8), Westinghouse Hanford Company, Richland, Washington.

- Contains a tank inventory estimate based on analytical information.

Shelton, L. W., 1995, *Radionuclide Inventories for Single- and Double-Shell Tanks*, (internal memorandum 71320-95-002 to F. M. Cooney, February 14), Westinghouse Hanford Company, Richland, Washington.

- Contains a tank inventory estimate based on analytical information.

Shelton, L. W., 1996, *Chemical and Radionuclide Inventory for Single- and Double-Shell Tanks*, (internal memorandum 74A20-96-30 to D. J. Washenfelder, February 28), Westinghouse Hanford Company, Richland, Washington.

- Contains a tank inventory estimate based on analytical information.

Van Vleet, R. J., 1993, *Radionuclide and Chemical Inventories for the Single-Shell Tanks*, WHC-SD-WM-TI-565, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

- Contains selected sample analysis tables before 1993 for single-shell tanks.

DISTRIBUTION SHEET

To	From	Page 1 of 2
Distribution	Data Assessment and Interpretation	Date 09/09/98
Project Title/Work Order		EDT No. N/A
Tank Characterization Report for Single-Shell Tank 241-SX-106, HNF-SD-WM-ER-645, Rev. 1		ECN No. ECN-643829

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
OFFSITE					
Sandia National Laboratory P.O. Box 5800 MS-0744, Dept. 6404 Albuquerque, NM 87815					
D. Powers		X			
Nuclear Consulting Services Inc. P. O. Box 29151 Columbus, OH 43229-01051					
J. L. Kovach		X			
Chemical Reaction Sub-TAP P.O. Box 271 Lindsborg, KS 67456					
B. C. Hudson		X			
SAIC 555 Quince Orchard Rd., Suite 500 Gaithersburg, MD 20878-1437					
H. Sutter		X			
Los Alamos Laboratory CST-14 MS-J586 P. O. Box 1663 Los Alamos, NM 87545					
S. F. Agnew		X			
Tank Advisory Panel 102 Windham Road Oak Ridge, TN 37830					
D. O. Campbell		X			

DISTRIBUTION SHEET

To	From	Page 2 of 2
Distribution	Data Assessment and Interpretation	Date 09/09/98
Project Title/Work Order		EDT No. N/A
Tank Characterization Report for Single-Shell Tank 241-SX-106, HNF-SD-WM-ER-645, Rev. 1		ECN No. ECN-643829

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
ONSITE					
Department of Energy - Richland Operations					
J. F. Thompson	S7-54	X			
W. S. Liou	S7-54	X			
J. A. Poppiti	S7-54	X			
DE&S Hanford, Inc.					
W. L. Cowley	R1-49	X			
G. D. Johnson	S7-73	X			
Fluor Daniel Northwest					
E. D. Johnson	S2-47	X			
Lockheed Martin Hanford, Corp.					
J. G. Burton	S7-21	X			
J. W. Cammann	R2-11	X			
J. G. Field	R2-12	X			
J. Jo	R2-12	X			
W. E. Ross	S7-84	X			
L. M. Sasaki	R2-12	X			
B. C. Simpson	R2-12	X			
R. R. Thompson	R2-12	X			
ERC (Environmental Resource Center)	R1-51	X			
T.C.S.R.C.	R1-10	5			
Lockheed Martin Services, Inc.					
B. G. Lauzon	R1-08	X			
Central Files	B1-07	X			
EDMC	H6-08	X			
Numatec Hanford Corporation					
J. S. Garfield	H5-49	X			
D. L. Herting	T6-07	X			
J. S. Hertzel	H5-61	X			
D. L. Lamberd	H5-61	X			
Pacific Northwest National Laboratory					
A. F. Noonan	K9-91	X			